CONTRIBUTIONS TOWARD A MONOGRAPH OF THE LEPIDOPTEROUS FAMILY NOCTUIDAE OF BOREAL NORTH AMERICA.

A REVISION OF THE SPECIES OF ACRONYCTA (OCHSENHEIMER) AND OF CERTAIN ALLIED GENERA.

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INTRODUCTION.

By John B. Smith.

In 1883 I was employed by Dr. C. V. Riley, then Entomologist to the U. S. Department of Agriculture, as a special agent of his Division, and, in addition to the economic work assigned to me, it was planned that I should devote as much time as possible to the study of the lepidopterous family Noctuidae, or "Owlet Moths." Dr. Riley had bred many of the species from larvae which, under their common appellation of "cutworms," are well-known pests to agriculture, and it was his desire that we should cooperate in the production of a systematic work in which the early stages were, in the main, to be his especial share. My own task was solely with the adult stages, and in certain genera all the work was to be done by Dr. Riley. In pursuance of this plan a great amount of material was accumulated and much manuscript was prepared.

In 1885 I became Assistant Curator in the U. S. National Museum, Dr. Riley occupying at the time the place of Honorary Curator. It was then intended that our joint work on the Noctuidae should be continued; but it soon became evident that we could not at that time secure the publication of such a work as was planned, and it was abandoned. A great deal of additional material had been received since the work was started, and I began to publish such parts as had been prepared, after reviewing each group and bringing it up to the date of publication.

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Among the genera reserved for study by Dr. Riley was *Acronycta*, which had interested him for years because of the differences noted among the larvae. Certain studies of structural characters were made by Mr. Theodore Pergande, of the Division of Entomology, and by myself, and under Dr. Riley's supervision most of the adults and all the obtainable larvae were figured in colors. It was intended that the work should make Bulletin No. 7 of the Division, to be published in 1885, and seven chromolithographic plates were actually printed. So many life histories were incomplete, however, and so much difficulty was encountered in obtaining missing species, that publication was postponed from time to time until, in 1891, Bulletin No. 7 was finally devoted to another theme, and the matter was allowed to rest for the time being. In 1889 I resigned my place in Washington to accept that now occupied by me in New Jersey, and all plans for combined monographic work by Dr. Riley and myself were abandoned.

Dr. Riley retired from the Department of Agriculture in 1894 and devoted himself to work in the U. S. National Museum, intending to take up and complete those lines of scientific study which were perforce abandoned through the burden of routine work in the Department. His untimely death prevented this; and in arranging his affairs his widow very kindly turned over to me the entire mass of papers and notes, together with all the original drawings and sketches referring to *Acronycta*.

On the occasion of my visit to the British Museum in 1891 I did not see the entire collection of *Acronycta*, partly because they were not then all included with the true Noctuidae by Mr. Butler, partly because, my time being limited, I relied upon the comparisons made by Dr. Riley.

The manuscript turned over to me contained the notes on the British Museum specimens made by Dr. Riley, and all the breeding notes and records accumulated for many years in the U. S. Department of Agriculture. There was no descriptive matter, however, and not even an outline of a proposed systematic division. All the systematic matter, therefore, is original.

To the kindness of Dr. L. O. Howard, who succeeded Dr. Riley as Honorary Curator of Insects in the U. S. National Museum, as he succeeded to his place in the Department of Agriculture, I owe the loan of the entire material, of every kind, in this group from both Museum and Department.

To this was added the collection accumulated by me for Rutgers College, and the rich material borrowed from Mr. J. Doll, of Brooklyn; Dr. R. Ottolengui, of New York; Mr. E. L. Graef, of Brooklyn; Mr. Philip Laurent, of Philadelphia; Dr. William Barnes, of Decatur, and Prof. George H. French, of Carbondale, Illinois. To Mrs. C. H. Fernald I owe a number of specimens from her own collection and others, with notes, from the collection of the Massachusetts Agricultural College Experiment Station.

Prof. J. H. Comstock kindly sent me all the material from the collections of Cornell University, and Dr. S. A. Forbes was equally liberal with material from the University collection at Urbana, Illinois. Mr. Beutenmüller, Curator of the Department of Insects in the American Museum of Natural History, kindly secured for me needed specimens from the Edwards collection and photographic reproductions of others. Dr. Henry Skinner allowed me to take desirable specimens from the collections of the Academy of Natural Sciences at Philadelphia and from that of the American Entomological Society, both of which are in his charge, and to these and to all others who have otherwise assisted me I offer sincere thanks.

The material accumulated was by all odds the best and most abundant ever gathered together in one place, and gave excellent opportunities for ascertaining the range of variation in the species.

Of recent years Dr. H. G. Dyar has systematically and critically studied the lepidopterous larvae, and proposed, in a pamphlet published by Mr. A. R. Grote, a scheme for the division of *Acronycta* on larval characters. I therefore asked Dr. Dyar to relieve me of the task of dealing with the early stages in this genus. As he kindly consented to do this, I turned over to him all the material and notes in my hands, and he is solely responsible for all pertaining to the immature stages. We worked independently toward a general system, and afterwards, comparing results, straightened out such slight discrepancies as were due to the use of subordinate characters. Each author is, therefore, solely responsible in his own branch; but the classification of the species is in all senses a joint result and a natural arrangement as based on adult as well as early stages.

THE GENUS ACRONYCTA AND ITS ALLIES.

By John B. Smith.

In the catalogues and lists of Noctuidae in general use, there is placed at the head a small series of species with plump, robust form, somewhat retracted head, and rather loose, divergent vestiture. This group has been variously named and vaguely defined; but there has never been any sharply marked character noted to differentiate it from the other Noctuids, though the title of some forms, like *Demas*, to be termed Noctuids at all has been disputed.

Following precedent, I arranged the series in my catalogue of 1893 as follows: *Panthea*, *Demas*, *Raphia*, *Charadra*, *Feralia*, *Momophana*, *Moma*, *Arsilonche*, *Merolonche*, *Acronycta*, *Harrisimemna*, and the genera allied to *Bryophila*.

In 1896, Mr. A. R. Grote[1] formed a "family" Apatelidae, for which no tangible characters of the imagines are given, and which is based in a vague way upon larval characters, of the genera *Demas*, *Charadra*, *Pan-*

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[1] Mitth. a. d. Roemer Mus., Hildesheim, No. 3.

thea, *Trichosea* (exotic), *Harrisimemna*, *Feralia*, *Momophana*, *Diphthera* [*Moma*], *Microcoelia*, *Apatela* [*Acronycta*] *Arsilonche*, *Simyra* (exotic), and *Oxycesta* (exotic).

Merolonche is omitted, probably by accident, since it is referred to as a division of *Acronycta* in another part of the paper.

Taking this aggregation, whether as arranged by Mr. Grote or myself, as a whole, it is impossible to define it without including also all the other Noctuidae. Dr. Dyar finds, however, that the larvae of Acronycta and some other genera differ from those of the normal Noctuids, and for convenience his restriction can be followed, though it leaves some unsatisfactory situations. For the reasons which lead Dr. Dyar to his conclusions, his notes on the larvae should be referred to; it must suffice to say here that only *Demas*, *Panthea*, *Charadra*, *Harrisimemna*, *Merolonche*, *Arsilonche*, and *Acronycta* are included. *Raphia* and *Feralia* are rejected from larval characters, and *Momophana* and *Moma* from adult structures. *Microcoelia* is divided, and one of its species is included in *Acronycta* on both larval and adult characters.

As restricted above, there are two very sharply defined series, differing in important structural characters. *Demas*, *Charadra*, and *Panthea* have vein 5 of the secondaries quite as strong as any other on that wing, and arising from the end of the median vein close to 4. The median vein is, in this case, therefore, distinctly quadrifid. Subordinate though congruent characters are hairy eyes and pectinated male antennae in all the species, and a certain similarity in habitus and type of maculation. But *Raphia* would seem to be, on adult characters, a proper member of this group, which for convenience I prefer for the present to regard as a tribe, *Pantheini*, though it is rather entitled to subfamily rank. It has the venation of the secondaries almost exactly as in *Charadra* and indeed agrees quite as well in the primaries also. The type of maculation is also similar and the body structure and pectinated male antennae are very like *Charadra*. The eyes are naked, but this is an unimportant character and only the male genitalia which are typically Noctuid and do not agree with those of the other species here associated bear out the larval indications. *Raphia* is therefore omitted in this treatise as I am at present unable to assign it a satisfactory position.

Among themselves the genera differ fairly well. *Panthea* and *Demas* are both incapable of feeding because of the weak, membraneous tongue, and both tend to a great variability in the origin of the veins about the accessory cell, which may be entirely absent or fully present in the same species. *Panthea* has more evenly triangular primaries with an almost straight inner margin, and the markings consist of band-like transverse lines. *Demas* has the primaries narrower, more abruptly widened at the base, giving the inner margin a curve at that point, and has the markings more normally developed. The differences are obvious but not striking.

Charadra is capable of feeding and has the antennae pectinated in both sexes, though shortly so in the female.

In the genera allied to *Acronycta*, which may be grouped as *Acronyctini*, the secondaries have vein 5 weak and arising from the cross vein quite remote from 4, though nearer to it than to 6. The character is an important one and not merely a greater or less development, which occurs within *Acronycta:* it is a difference of derivation which makes the median vein strictly trifid and 5 really "independent." So far as my present experience goes there is nothing in the venation of the *Acronyctini* that is in any way different from that of the *Agrotids* or *Hadenids*, and the tribal term has nothing to maintain it in the adults except a habitus, though it is well based in the larvae according to Dr. Dyar. On the contrary the *Pantheini* (or even *Pantheinae*) are sharply differentiated from all those immediately associated with them on adult characters, though they resemble *Acronycta* in the larval stage. In other words there is no real basis for associating the Pantheid series with the Acronyctid or any other true Noctuid series on adult characters alone, so far as they are now appreciated.

As subordinate characters in the Acronyctids we have uniformly naked eyes, usually simple antennae in both sexes, and an undescribable Bombycid appearance.

Four genera are indicated, which may be headed by *Acronycta*, in which the antennae are simple in both sexes, the tongue useful for feeding in all cases, the palpi fairly well developed, the vestiture hairy or with flattened hair and scales intermixed, and the transverse lines and ordinary spots fairly indicated in all cases.

Arsilonche differs in the weak tongue, which is useless for feeding, and in the strigate maculation, which leaves no trace of the transverse lines or ordinary spots apparent. The genus is a continuation and intensification of the characteristics of group *auricoma*, to which it belongs in the early stages.

Merolonche is a much more strongly marked offshoot from that same stem. The body is somewhat more robust, the vestiture longer and more shaggy, the head more retracted, the palpi small, the tongue weak, and the antennae shortly pectinated or rather lamellate in the male. In venation and genital structure there is no departure from the normal *Acronycta* type.

Harrisimemna is distinctly aberrant and tends to the Bryophilid series. Its peculiar maculation gives it a somewhat misleading appearance, but in venation and in all the essential structural characters it is a typical Noctuid. The shortly pectinated antennae are out of place in this position, and the scaly vestiture and exaggerated tuftings are totally unlike any of the other forms here associated. It is aberrant in all stages and really stands by itself, with close mimics of it found in the Bryophilid series. In the sexual characters there is an apparent leaning to the Pantheid series, but too little is known of these characters in seemingly allied genera to make this of any great importance at present.

It will be seen from this review that the last word on the relationship of the genera treated in this paper has not been said, and that their association as adults is not fully warranted except from convenience.

In tabular form the groups and genera above referred to may be arranged as follows:

ANALYTICAL KEY TO GROUPS AND GENERA.

- Vein 5 of secondaries as strong as the others and arising from the median vein close to 4; eyes hairy .... PANTHEINI.
  - Tongue short and weak, useless for feeding; antennae pectinated in the male, simple in the female.
    - Primaries broad, trigonate, inner and outer margin approximately equal in length .... *Panthea.*
    - Primaries narrower, more abruptly widening at base, the inner margin longer than the outer .... *Demas.*
  - Tongue moderate, useful for feeding; antennae pectinated in both sexes; though shortly in female .... *Charadra.*
- Vein 5 of secondaries weak, arising from the cross-vein remote from 4; eyes always naked .... ACRONYCTINI.
  - Antennae simple in both sexes.
    - Tongue moderate or strong; ordinary spots or transverse maculation at least traceable .... *Acronycta.*
    - Tongue weak and short; maculation strigate, without trace of ordinary spots or transverse lines .... *Arsilonche.*
  - Antennae shortly pectinated in the males.
    - Ashen gray species with hairy vestiture, body plump, wings small; abdomen untufted .... *Merolonche.*
    - Brightly colored and marked, with scaly vestiture; body slight; wings large, abdomen prominently tufted .... *Harrisimemna.*

THE EARLY STAGES OF ACRONYCTIDS.

By HARRISON G. DYAR.

The descriptions of larvae, which I have prepared to supplement Professor Smith's account of the imagines, are taken almost entirely from my own notes. Professor Smith had practically no useful notes on early stages to turn over to me, but there was considerable material in alcoholic and inflated specimens. Most of this, however, consisted of the common species on which I already had notes, and only a few of the specimens were of service. Fortunately, my notes were rather full in the Acronyctid forms, though far from complete, as I had not made special efforts to finish them.

The larvae of the Lepidoptera present a number of well-marked differences in structure among themselves, affecting principally the clothing of hairs. These differences are very well marked in the Acronycta larvae. So great is the diversity that Dr. A. G. Butler formerly attached much importance to it, referring the several species of Acronycta to different families of moths, according as the larval character corresponded. On these lines our *A. funeralis* would be an Agaristid or Noctuid, since this species and some Agaristids and Noctuids possess in common single spatulate hairs. *A. luteicoma* would be a Liparid from the brush-like tufts; *A. noctivaga* an Arctian from the tufts of stiff hairs and black coloration; *A. lobeliae* a Lasiocampid from the weak hairs and flattened form, etc. I mention these views of Dr. Butler's, though they have been long since refuted, not only because they refer specially to Acronycta, but also because they illustrate the difference between a classification based on superficial resemblance *versus* one on phylogenetic characters. I will briefly review these more fundamental points. They are seen in the position of the hairs (single or multiple) rather than in their modification. The modification is essentially adaptive, is quickly affected by a difference in habit, and hence not reliable in classification. The position, on the other hand, is only slowly affected by evolution and gives characters for large groups. These groups prove to be of the grade of superfamilies. The five primitive setae on the abdomen, as in Plate XVIII, fig. 1, are characteristic of the Tineides (the Micro-lepidoptera and allies), Saturnians, and Butterflies. Tubercle V moved up before the spiracle, is the condition in the Sphinges (Plate XVIII, fig. 2), while Tubercle IV moved up behind the spiracle is that of the Bombyces (Plate XVIII, fig. 3). The several families of the Bombyces are separated by a number of lesser characters. The lower families have single hairs, as in the figure. The higher ones have a tuft of hairs in place of each single hair. Among these there are two distinct lines of modification of the thoracic hair tufts (warts) which separate two large groups. The group including the Bombycidae proper leads up from the Notodontidae, culminating in the Lasiocampidae. The other starts from the Noctuidae and includes the Arctiidae, culminating in the Euchromiidae (Syntomiidae). The conversion of single hairs into warts has taken place several times independently among the Bombyces, so that the ultimate structure is not an absolute criterion of affinity. Moreover, a return to the single haired condition sometimes occurs, so that these characters have to be used with a certain caution. The result is that family characters are often not strongly marked in the larva, in which they contrast with the superfamily ones mentioned above—characters which are more strongly marked than those of the same grades in the imagines.

Now there are certain moths, usually classed as Noctuidae, whose larvae have many-haired warts. They have been recently discussed by Mr. Grote under the term Apatelidae. There are, however, no family characters in the moths, though Professor Smith deems himself almost warranted in separating part of them, as a subfamily. The other part, including Acronycta, are true Noctuids. It is this group, the Apatelidae of Grote or *Pantheinae* and certain genera of the *Noctuidae* which form the subject of the present article.

Eggs.—The eggs are circular and much flattened, the micropyle in the center of the upper side, ribbed and with faint cross-striae. The characters are the same as in the English species, as described by Dr. T. A. Chapman. So few of our species are known that it is impossible to generalize on them and useless to specially discuss the few cases.

Larvae.—The larvae of this genus are especially interesting from the wide range of the characters of the hairs. The range covers forms with single setae, with true many-haired warts and those in which this primary coating is almost completely replaced by a secondary one of the hairs growing from the skin. This is as great a range as is shown by any of the families of the whole Bombyces. All the species may be traced back to a ground form, which may be described as a typical Noctuid in which warts have been developed, accompanied by a tendency to the production of secondary hairs. The species have made the most of this comprehensive structure. In the single-haired forms degeneration has occurred, as may be seen by the presence of true warts in the earlier stages. The Arctian-like forms have preserved the warts intact without secondary hairs. Another series has developed the secondary hairs at the expense of everything else.

The species divide into four well-marked groups. The first comprises those with abundant secondary hairs. All the American species have a series of dorsal tufts or pencils, variously modified, and in some cases absent in the last stage. The coloration is very diverse. (Group *americana.*)

In the second group the warts are small, the secondary hairs weak, but present in some degree. There is a wide range in the coloration of these forms at maturity, where various adaptations and cases of mimicry occur, though before the last stage very diverse forms are often strikingly alike. (Group *lobeliae.*)

The third group have warts in the early stages in all the American species so far known, which may degenerate to single hairs in the last stage except in the case of tubercle VI. Secondary hairs are absent. In two cases the hairs are spatulate. This group appears at first sight a compact one, but from the results obtained from the study of the male genitalia of the moths it appears that the single-haired species are really derived from two different sources within the genus. One section (group *hamamelis*) has the structure of *retardata*, while the other (group *persuasa*) seems to have arisen from a point near *cuspis* and *tridens.* The structure of Group IV may be derived from Group III by the loss of the secondary hairs, and the only unexpected point that the male genitalia indicate is that the single-haired structure has been developed twice. The loss of secondary hairs would be expected to accompany this change. (Groups *persuasa* and *hamamelis.*)

The fourth group is more compact. The warts are well formed and bear spreading tufts of hair, in some cases supplemented by bunches of fine feathery hairs which in *luteicoma* become markedly developed.

Secondary hairs are absent. Most of the species are black or brown and are low feeders like Arctians. (Group *auricoma.*)

Four larvae, not belonging to *Acronycta*, are known, which have nearly the same characters as the Acronyctids. They comprise the genera *Demas*, *Charadra*, *Panthea*, and *Harrisimemna*. *Raphia*, *Feralia*, and *Bryophila* have not these characters, while *Momophana*, *Diphthera*, *Cerma*, *Polygrammate*,[1] *Cyathissa*, and *Chytonix*, usually associated here,

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[1] Since this article was sent to the printer, I have bred *Polygrammate hebraicum*. The larva is an Acronyctid, but only a portion of the warts are many-haired. It is unlike all the other species, the only suggestion of affinity being in the habit of pupation, which suggests *Harrisimemna*. The following are the characters:

LARVA.

Stage I.—Whitish, the body a little green tinted at the end of the stage; width of head, 0.2 mm. Warts small, but apparently as in the following stage: I, two-haired; III, several haired. The length reaches 2 mm. The exact details of stage I and true number of stages not determined.

Stage II.—Flattened, the warts as in the following stages: III, large and many haired; width of head, 0.3 mm.; length, 4.8 mm. Whitish, with a green tint.

Stage III.—Head round, green, width, 0.5 mm. Body flattened, wart I, two haired; II, single; III, many haired. Green, a trace of a white subdorsal line. The body tapers behind and the feet are normal. Length, 6.5 mm.

Stage IV.—Head green, width, 0.9 mm. Wart I, two haired; II, IV, and V, single; III and VI, many haired. Wart III is very prominent, projecting from the sides. Green, a narrow white subdorsal line, below wart II and small intersegmental dorsal dots. Length at end of stage, 8.5 mm.

Stage V.—Green; head, 1.6 mm. Warts as before, the hair fine and pale. A single dorsal and paired addorsal white dots; subdorsal line on joints, 3 to 13; white, just below wart II. Anal feet divergent, as seen from above. Length, 14 mm.

Stage VI.—Head rounded, whitish green, mouth white; a tiny black dot in the middle of each lobe before; width, 2.2 mm. Body appears much less hairy than before. Wart I still has several hairs, but the tuft is so small as only to be seen by the lens; II has a single strong hair; III a strong hair and a few small, weak ones; IV a tiny hair; V a strong hair; VI several small hairs. The thoracic warts are similarly reduced. Color clear green, the dorsal intersegmental white dots elongated, addorsal ones round; subdorsal line straight, yellowish white; wart III shining; spiracles reddish; claspers of abdominal feet elongate. In some, the spiracles, warts V and VI of abdomen and III, IV+V, and VI of thorax are surrounded narrowly by red-brown. Dorsal hair dusky, subventral hair pale. Later the ground color is more whitish, less clear green, joint 2 and head a little yellowish, the markings less contrasted. At the end of the stage a marked change in color takes place. Head shaded with purplish leaving blotches of white dots confluent in groups over the faces of the lobes; ground color in front and on clypeus still greenish. Body grayish white over the back to wart V, all the warts orange color. White dorsal and lateral lines, the stigmatal region all white, broken obscurely by greenish in the incisures of the faint annulets. A series of numerous purple-brown spots in an irregular geminate row of four dorsally, the second single; before wart I, behind wart II, above and below the subdorsal line, small, diffuse; before and behind wart III; over most of the subventral space, forming a sharp lower border to the white stigmatal space, cut on the segmental incisures. Dorsum faintly purplish shaded. Setae all dark.

After acquiring this coloration the larvae left the leaves where they had hitherto rested and finally bored in soft wood to pupate, in the manner of *Harrismemna*, throwing out the chips united by threads into small irregular balls.

Pupa.—Cylindrical, slender, light brown, slightly shining. The cases are smooth, are unknown. Of the four that are known, *Charadra* and *Demas* fall in Group IV, though with important differences; *Harrisimemna* falls in Group III rather than any other, though aberrant, and *Panthea* falls doubtfully in Group I. *Charadra* and *Demas* have not the pupal characters of Group IV (*Viminia*), and they doubtless represent a different stem. These four Pseudo-Apatelid forms (*Pantheinae*) separate as follows:

True warts present, not degenerate:
  Secondary hairs present, sparse, hair pencils present .... *Panthea.*
  No secondary hairs.
    Hairs stiff; pencils present .... *Demas.*
    Hairs soft; no pencils .... *Charadra.*
Warts degenerate, single haired above VI .... *Harrisimemna.*

The following table will separate the American species of *Acronycta* whose larvae are known. The more important European species are also included for comparison. *Falcula*, *connecta*, and *lanceolaria* I have not seen, but have placed by the descriptions only, which, unfortunately, are usually silent on the crucial points. Therefore these species may not be correctly placed. In the special descriptions following, only very few cases of full life histories are made out.[1] The larvae have generally been found young and bred up, the first stage especially usually wanting. Except in Group IV, I have assumed six stages, following Chapman, and numbered those observed to correspond; but it should be noted that there may be more, and the relations and characters of Stage I need further study in nearly all cases, even where a stage is marked "I." From Dr. Chapman's remarks it appears that in certain of the species the primitive first stage may have disappeared; but our knowledge of the American species is too scanty to admit ot more than mentioning that this point is to be looked out for.

The notes of Dr. C. V. Riley have been used when I have had none of my own, as well as some kindly communicated by Mrs. C. H. Fernald. Special acknowledgment is given in all cases to every author quoted. The specimens preserved in the U. S. National Museum, and mostly collected by Dr. Riley, have been freely examined, serving as the basis for several descriptions.

Three descriptions of Apatela larvae are not referred to. They are by Dr. Packard, in the Fifth Report U. S. Entomological Commission,[2] undetermined. They seem to be immature or non-Apatelid forms, and I can not guess what they may be.

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the thorax above shagreened; abdominal segments rather thickly punctured, except in narrow posterior rims, which are smooth. No cremaster, but the last segment is enlarged above, smooth and shining, with a series of short longitudinal grooves in the depression preceding the enlargement; below the segment is less enlarged, not shining, and bears several slender hooks in a transverse row on either side, directed obliquely downward. Length, 9; width, 2.5 mm.

Food plant, sour gum (*Nyssa sylvatica*).

[1] Only *morula*, *furcifera*, *grisea*, and *noctivaga*.

[2] Pages 461, 498, and 897.

Pupae.—In his full and valuable account of the English Apatelae, Dr. Chapman divides the genus into three sections or genera on pupal characters. His third section comprises only *ligustri*, which is not an Acronyctid at all, and may be omitted from consideration. There remain two groups, the first with the pupa of the ordinary Noctuid pattern, smooth, brown, tapering regularly from the thickest part of the thorax to the anal segments, which are somewhat rounded, the abdominal segments punctured in front; cremaster with a series of curved spines or hooks in two sets, one above the other. This section includes the larvae of the first three groups.

The pupae of Dr. Chapman's second section (I have transposed his numbers) are black, or nearly so, with a rough wrinkled surface, the free abdominal segments as wide or wider than those in front, the terminal segments rapidly tapering. The posterior margin of each segment has a raised band, like a barrel hoop, which is smooth. Cremaster furnished with a bunch of stiff, brown bristles. This section corresponds to the fourth group of larvae.

There is thus an exact correspondence between pupal and larval characters, but the latter are more delicate, defining three groups where the pupae can show but one. On the other hand the characters drawn from the male genitalia are still more sensitive and indicate more groups than the larvae, while contradicting none.

ANALYTICAL KEY TO THE KNOWN LARVAE OF ACRONYCTA.

1. Warts, small, subfunctional, few or single haired at maturity; secondary hairs more or less developed, ranging from none to a complete development. Pupae smooth, tapering. (*Cuspidia* Chapman) .... 2.
Warts, large, functional, many haired; secondary hairs absent from body, the wart hairs sometimes of two forms. Pupae rough, the posterior edges of the segments marked with smooth raised rings. (*Viminia* Chapman; larval section IV) .... 31.
2. Secondary hair abundant, predominant. (Larval section I) .... 3.
Secondary hairs few or absent, never predominant .... 10.
3. Without contrasting dorsal hair pencils at maturity .... 4.
With distinct hair pencils in the last stage, rising above the secondary hairs. 7.
4. Hair parting in irregular tufts to show a series of dorsal marks .... *aceris.*[1]
Hair not parted; black pencils present dorsally before the last stage .... 5.
5. Hair long, thin, and pale .... 6.
Hair dense, short, brown, and black .... *hastulifera.*
6. Hair soft, curving over unsymmetrically .... *leporina.*[2]
Hair soft, but straight, not curved .... *frigida.*
7. Pencils only on joints 5, 7, and 12 .... 8.
Pencils on other joints besides 5, 7, and 12 .... 9.
8. The pencils on joints 5 and 7 paired .... *americana.*
No pencils paired .... *dactylina.*
9. No pencil on joint 6 .... *populi.*
A pencil on joint 6 as distinct as the others .... *rubricoma.*

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[1] European.

[2] American and European.

10. Secondary hairs present, though sometimes very few; warts more than one-haired at maturity. (Larval Section II) .... 11.

No secondary hairs; warts usually single-haired in the last stage, except wart VI. (Larval Section III) .... 25.

11. Not green at maturity (nor the alternative brown) .... 12.

Green on the sides at maturity, or the alternative brown .... 18.

12. A dorsal elevation on joints 5 and 12 .... 13.

No dorsal elevation on joint 5, but one on joint 12 .... *occidentalis.*

No distinct elevated areas .... 15.

13. An elevation on joints 5, 8, and 12; dorsal band dark .... *morula.*

No elevation on joint 8 .... 14.

14. Dorsal band yellow, elevation on joint 5 long .... *psi.*[1]

Dorsal band yellow, elevation on joint 5 continued by long hair tuft .... *cuspis.*[1]

Dorsal band reddish, elevation smaller and no tuft .... *tridens.*[1]

15. Black, with seven yellow lines, like *Datana* .... *radcliffei.*

Black, with a broken dorsal red line .... *furcifera.*

Of a uniform mottled brown, appearing flattened dorsoventrally .... 16.

16. Head black lined; a pale patch on joint 11 .... *megacephala.*[1]

A red patch on vertex of head; body uniformly colored .... 17.

17. Warts I and II dark, contrasting; head 3.7 mm. wide .... *betulae.*

Warts I and II dark, two rows of lateral yellow spots .... *innotata.*

Warts I and II pale, not contrasting; head 5.5 mm. wide .... *lobeliae.*

18. Olivaceous with darker green patches on joints 5, 8, 9, and 12 .... *impleta.*

A dark-brown dorsal line .... 19.

No dorsal line nor patches .... *vinnula.*

19. Dorsal line straight and even .... 20.

Dorsal line widened on joints 7 to 12 without central patch .... 22.

Dorsal line widened, but containing a central green patch .... 24.

20. Dorsal line continuous .... 21.

Dorsal line broken, obscure, just touching warts I .... *fragilis.*

21. Dorsal line reaching to warts II .... *superans.*

Dorsal line reaching only to warts I .... *falcula.*

22. Dorsal band widened on joints 8 to 12 .... 23.

Dorsal band widened only on joints 8 and 9 .... *pruni.*

23. A brown dorsal mark on joint 2 .... *strigosa.*[1]

Joint 2 green .... *lithospila.*

24. The central green patch present on joints 9 to 11 .... *grisea.*

The green patch on joints 7 to 12 .... *tritona.*

25. Hairs multiple; segments with five transverse brown bands .... *retardata.*

Hairs single, not enlarged .... 26.

Hairs single, some of the dorsal ones spatulate at tip .... 29.

26. No subdorsal yellow line .... 27.

A broad yellow subdorsal line .... *connecta.*

27. Body uniformly colored .... 28.

A blackish lateral shade, inclosing a dorsal V-mark on joints 11 to 12 .... *exilis.*

28. With subdorsal cream-colored spots over tubercles I .... *ovata.*

Without these spots .... *hamamelis.*

29. Body brown, uniform .... *afflicta.*

Body black, with large, segmental dorsal white spots .... 30.

30. These spots on joints 5 to 12 marked with two brownish crossed lines .... *alni.*[1]

These spots centered with a transverse black dash .... *funeralis.*

31. Body not green .... 32.

Body green, hairs pale, mixed with a few black ones .... *lanceolaria.*

32. Warts with more or less fine, feathery hairs among the bristles .... 33.

Warts without fine, feathery hairs, but the spines often soft .... 40.

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[1] European.

33. These hairs forming collared tufts, resembling *Orgyia* .... *luteicoma.*
These hairs not forming such tufts .... 34.
34. A distinct pale subdorsal line or row of spots .... 35.
No distinct subdorsal line .... 36.
35. A dorsal row of red dots .... *rumicis.*[1]
Dorsal space black .... *auricoma.*[1]
36. A dorsal red patch on joint 3 .... *abscondita.*[1]
No such unpaired dorsal patch .... 37.
37. A distinct substigmatal row of lunate yellow spots .... *oblinita.*
Substigmatal band faint, not yellow .... 38.
38. Warts I and II with contrasting white spots .... *xyliniformis.*
Without these spots .... 39.
39. Black, substigmatal band reddish .... *noctivaga.*
Tawny reddish, more or less suffused with black .... *sperata.*
40. Entirely black .... *menyanthidis.*[1]
Black with substigmatal pale line .... 41.
41. No pale subdorsal line .... 42.
A pale subdorsal line present besides the substigmatal one .... 43.
42. Hair all black .... *myrica.*[1]
Hair pale, except for a few black ones on joints 5 and 12 .... *distans.*
Hair pale, foxy red at the ends of the body .... *impressa.*
Hair red the whole length .... *euphorbiae.*[1]
43. Black predominating, hairs mostly soft .... 44.
Incisures broadly pale, hair more bristly .... *Simyra dentinosa.*[1]
44. Warts not red .... *Simyra nervosa.*[1]
Warts red .... *Arsilonche albovenosa.*[2]

DETAILED ACCOUNT OF GENERA AND SPECIES.

PANTHEA Hübner.

Panthea HÜBNER, Verzeichniss, 1816, p. 203.

Plump, robust species, with retracted head, short quadrate thorax, long, stout, cylindrical abdomen, and large, trigonate, pointed primaries.

The head is broad, retracted, front flat, eyes widely separated, all the sutures obscured. Ocelli very small, concealed, somewhat remote from the extreme posterior angle of the eye. Tongue short and weak. Palpi small, slender, hardly extending to the front and practically invisible from above. Antennae heavily and rather lengthily bipectinated in the male; simple in the female. Eyes hairy, without lashes.

The thorax is quadrate, rather wider than long, with smooth, hairy vestiture, which is somewhat loose, but marks the collar and patagiae, and seems somewhat abruptly cut off posteriorly.

The legs are short, stout, very much of a size, clothed with rather long, loose hair. They are unarmed, except for the usual spurs which are short and rather weak. All the tarsal claws are simple in the species examined.

The abdomen exceeds the anal angle of the secondaries in both sexes, but in the female is much the longer, plump, and cylindrical. There are no tufts.

The wings are large, well clothed with scales, and are set well forward on the thorax. Primaries broadly trigonate, the outer margin oblique, the apex considerably produced, so that the costa is almost double the length of the inner margin. The venation is normal, except for the origin of the veins from the accessory cell. This latter may be entirely absent and is never well developed; but hardly two of my specimens are entirely alike. The only permanent feature is that veins 7 to 10, inclusive, always rise from this point, though 7 may be stalked with 8 + 9, or 8 + 9 may be stalked with 10. Sometimes all rise from one point, and again 7, 8 + 9, and 10 may be entirely distinct.

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[1] European.

[2] American and European.

The secondaries are proportionate, well developed, with vein 5 as strong as the others and usually close to 4, so as to form part of the same series. This is not entirely uniform, however, and 5 may be quite well removed from 4, though always of full strength.

Three of the species agree in genitalic characters, the harpes being broad, somewhat irregular, and with a small, very stout, obtuse, curved, corneous clasper, at the lower angle of the tip. The odd species is *gigantea*, which has a very large, broad, corneous clasper, which is scoop shaped, quite abruptly bent and pointed at the tip.

The species agree closely in general type of maculation, all having the ordinary lines and the median shade a single, broad, black band, while the subterminal line is marked by a broad. black, dentate preceding shade. All are ashen gray or black powdered on a white ground.

Furcilla differs at once from all the others by lacking all trace of the ordinary spots. The lines are even, quite well defined, and the median line as a rule touches and for a short distance unites with the transverse posterior.

Gigantea has the reniform present and is at once the largest and darkest of the species. The primaries seem almost blackish, the thoracic markings are practically obscured by the powderings, and the transverse lines on the primaries are quite narrow and even.

Portlandia is almost white in ground color and only a little powdery. The reniform is distinct, a little diffuse, and the transverse lines also, while distinct, have the margins powdery and somewhat diffuse. All the lines are entirely separated in all the specimens under examination.

Acronyctoides is the smallest of the species, and in all the specimens I have seen the orbicular is present as a black spot. There is a dark shade between the median and transverse posterior lines which gives a broad, band-like effect below the middle, and the subterminal space is almost entirely dark filled.

The species are thus all distinct and may be arranged in tabular form as follows:

ANALYTICAL KEY TO THE SPECIES OF PANTHEA.

Ordinary spots of primaries entirely wanting.
    The ordinary lines and median shade are prominent, broad, and black.. *furcilla.*
Ordinary spots represented by the reniform.
    Very dark, powdery gray, with the black transverse lines even and narrow. *gigantea.*

Ground color whitish gray, sparsely powdered, with the transverse lines broad and somewhat diffuse .... *portlandia.*

Ordinary spots both present.

Ground color whitish, the transverse shades very diffuse, and partially united. *acronyctoides.*

PANTHEA FURCILLA Packard.

(Plates VIII, fig. 37, larva; IX, fig. 1, adult female; XIX, fig. 2, male genitalia.)

Platycerura furcilla PACKARD, Proc. Ent. Soc. Phila., III, 1864, p. 374.—STRETCH, Zyg. & Bomb., 1873, p. 230, pl. IX, fig. 15.—GROTE, Bull. Geol. Surv., VI, 1881, pp. 258, 277.

Panthea furcilla SMITH, List Lepidoptera, 1891, p. 34.

Ground color very pale gray, more or less black powdered, changing the appearance of the insects considerably, as it is light or heavy; sometimes with a vague rufous tinge. Collar with a vague central banding; thorax with two or three somewhat undefined dusky transverse bands. Antennae yellowish in the males.

Primaries with the transverse bandings black, heavy, quite even, except for the subterminal line. Basal half line distinct and reaching the submedian vein. Transverse anterior line a little irregular, but as a whole outwardly oblique and very even. Median shade line broad, even, almost upright, and touching the transverse posterior line in the submedian interspace. Transverse posterior line a little oblique from the costa to vein 4, and then with a broad, even incurve to the inner margin. In paler specimens a whitish shade marks this line exteriorly. Subterminal line very irregular and sharply dentate, with a deep incurve between veins 4 and 6, sharp teeth on veins 3 and 4, and another deep incurve between veins 1 and 3. The line is most heavily black shaded toward the apex and becomes much less evident toward the inner margin. The line is followed by a more or less evident white shade, and there is sometimes a broken, dusky terminal line. The ordinary spots are entirely wanting. Secondaries whitish, smoky at base, with a vague, smoky exterior band and with a smoky discal lunule. There is also a broken dusky line at the base of the pale fringes. Beneath grayish powdery, disk of primaries darker, with the bands of the upper side indicated, and the subterminal line very sharply defined. Secondaries whitish, with two transverse dusky bands and a dusky discal spot.

Expanse, 1.35 to 2 inches (34 to 50 mm.).

Habitat.—Canada; Kittery Point, Maine, July 3 to August 14; Sharon Springs, New York, August 8; Albany, New York, July; "New York," in June; Minnesota, July; Florida.

There is considerable variation in this species, due to the irregularity of the black powdering. In some cases the shading is very even, leaving the black bands prominently relieved, while in others there is a real marbling and the lines are narrower, white-shaded, and more diffuse. This latter type predominates among the northern specimens and makes a strong approach in appearance to *portlandia*, though the ordinary spots are always wanting, so far as my experience goes.

LARVA.

LINTNER, Twenty-sixth Rept. N. Y. State Cab. Nat. Hist., 1872, p. 132, fig. 7.—THAXTER, Papilio, 1883, III, p. 11.—FERNALD, Stand. Nat. Hist., 1885, II, p. 453.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 774, pl. XI, fig. 8.

Stage VI.—"Head large, rounded, reddish. A pair of stiff spike-like tufts of hair, reddish at base, blackish at end, arise from the dorsal tubercles (of joint 2); a pair one-third as long (on joint 3). Body and hairs pale rust red; a lateral irregular whitish stripe, sending prolongations upward; an interrupted dorsal whitish line. Legs reddish." (Packard.)

Stage VII.—Head white, so thickly dotted with light reddish as to appear of that color; an irregular vertical white line on each side of the median suture and a transverse one on ocelli. Warts distinct, normal; a few secondary hairs, especially subventrally. Hair black from warts I to III, pale brown V, VI, all fine and rather short. From tubercle I on joints 2 and 3 and from II on 5 and 12 a distinct black pencil. Body light pinkish brown, whitish dotted; warts orange; an obscure white dorsal line and distinct substigmatal one excised at the spiracles; an undulating row of black dots laterally, four per segment. Spiracles white surrounded by a smoky black shade. Venter and legs rather pale. Another form is "glossy black, sparsely clothed with tufts of white hairs. Hair pencils clear white or tinged with olive. A lateral (substigmatal) row of white spots extending superiorly and anteriorly just below the stigmata." (Thaxter.)

Food plants.—Larch, pine.

PANTHEA GIGANTEA French.

(Plates IX, fig. 2, male; fig. 3, female adult; XIX, fig. 3, male genitalia.)

Platycerura gigantea FRENCH, Can. Ent., 1890, XXII, p. 134.
Panthea gigantea SMITH, List Lepidoptera, 1891, p. 34.

Ground color whitish, so heavily black powdered that it seems black, with a powdering of white scales and hair. This also gives the wings a somewhat semitransparent appearance. The thorax is crossed by two rather indistinct transverse black bands, which are hardly relieved against the dark background. Primaries with the transverse lines single, black, and well defined. Basal half line present, but hardly traceable below the costal area. Transverse anterior line rather narrow, even, sharply defined, almost rigidly upright, and marked by a few preceding pale scales. Transverse posterior line even, black, well defined, evenly oblique from costa to vein 4; then with an even, well-marked incurve to the inner margin. This line is followed by a whitish shading. Median shade line less evident and narrower than the others, best marked and with a distinct incurve across the cell, and below it almost straight, and much less defined. It does not touch the transverse posterior line in my specimens. The subterminal line is almost exactly as in *furcilla*, but a little less marked. There is a distinct dusky lunule representing the reniform; but the orbicular is absent. Secondaries in the male whitish, with a blackish shading along the inner margin; in the female smoky, with an indefinite darker exterior band. Beneath smoky, paler in the male, terminal space gray, the subterminal space darker, making a vague transverse band, which is continued across the secondaries, on which a discal spot is also apparent.

Expanse, 1.90 (male) to 2.30 (female) inches (48 to 58 mm.).

Habitat.—Colorado; Texas.

I have only a single pair of this fine species, through the courtesy of Mr. Philip Laurent; hence I can not speak as to variations. Nor have I any better or more accurate localities than above given. The species is sharply distinct from its allies in size, dark color, and in the structure of the male genitalia.

PANTHEA PORTLANDIA Grote.

(Plates IX, fig. 4, female adult; XIV, figs. 1, 5, head and thorax; XV, fig. 5, male antenna; XVI, fig. 1, venation; XVII, fig. 6, leg structure; XIX, fig. 1, male genitalia.)

Panthea portlandia GROTE, Mitth., a. d. Roem. Mus., Hildesh, 1896, No. 3, p. 14.

Ground color white or nearly so, more or less black powdered. Collar with a smoky shading at base and blackish line at tip. Patagiae crossed by two blackish bands and the bunching of scales and hair at the base of the thorax is also black tipped. On the primaries the black powdering is, as a whole, more dense along the inner margin, and before the subterminal line, which is thus shaded. It also tends to extend upward a little in the median space. Basal line traceable only across the costal area. Transverse anterior line single, broad, black, a little irregular, but, as a whole, outwardly oblique. Transverse posterior line upright to vein 4, but a little toothed on the veins; below that point with an even incurve broken by a tooth on the submedian vein. Median shade line well marked, as broad or broader than the others, almost rigidly upright to the submedian interspace, below which it runs close to and parallel with, but does not touch, the terminal posterior line. The subterminal line is broadly black shaded and prominently toothed. The most prominent teeth are on veins 3 and 4, and in the interspaces between 5 and 6, and 6 and 7. Between these and below vein 4 the line is incurved and less conspicuously dentate. There is a terminal black line which tends to break up into spots or lunules. The orbicular is wanting, but the reniform is present, either as a black lunule or as a crescent with black margin and whitish center. The terminal space is a little black powdered. Secondaries whitish, a little dusky at the base, and with a blackish, diffuse, exterior band. Beneath, primaries smoky to the terminal space, all the markings of the upper side faintly visible; terminal space powdery white; secondaries whitish, with two narrow and one broad, diffuse, smoky transverse bands.

Expanse, 1.60 to 1.90 inches (40 to 48 mm.).

Habitat.—Victoria and Corfield, Vancouver; Northwest British Columbia; Seattle, Washington; Portland, Oregon.

This species has been taken in some numbers by Dr. Dyar, at light, and seems to be not uncommon. It is the palest of all our species and easily distinguishable from those resembling it in size. There seems to be little variation, save in the amount of the black powdering.

PANTHEA ACRONYCTOIDES Walker.

(Plates IX, fig. 5, male; fig. 6, female adult; XIX, fig. 4, male genitalia.)

Audela acronyctoides WALKER, Can. Nat. and Geol., 1861, VI, p. 37.—GROTE, Can. Ent., 1877, IX, p. 27: Bull. Geol. Surv., 1878, IV, p. 169.

Panthea acronyctoides SMITH, List Lepidoptera, 1891, p. 34.

Panthea leucomelana MORRISON, Proc. Ac. Nat. Sci., Phila., 1875, p. 428.—GROTE, Bull. Geol. Surv., 1878, IV, p. 169, pr. syn.

Ground color white or nearly so, quite heavily powdered with smoky and black scales. Disk of thorax smoky; tip of collar black; patagiae crossed by two blackish bands. Primaries quite heavily powdered with smoky or black, the tendency being to leave the basal space moderately pale, the cell almost whitish, and the terminal space gray. Basal line black and traceable across the cell. Transverse anterior line single, almost upright, but well outcurved in the interspaces. It is variable in width and in definition. Transverse posterior line irregular, narrow, denticulate, strongly incurved in the submedian interspace. Median shade line distinct, broad, diffuse, usually parallel with the transverse posterior line; the tendency being to fill the space between these lines completely. Subterminal line very strongly dentate; much as in *portlandia*, but the teeth yet more marked. The subterminal space is smoky almost to the transverse posterior line, leaving only a narrow white shade. There is a terminal dusky line tending to break into spots, and the terminal space is blackish powdered, sometimes becoming smoky. The orbicular is present as a black dot; the reniform as a small black crescent. Secondaries whitish; more dusky at base, with a blackish submarginal band which shades gradually toward the base and, as a whole, the female is much darker than the male. Beneath whitish, both wings crossed by three rather indefined smoky bands, which are much better defined on the secondaries.

Expanse, 1.45 to 1.55 inches (36 to 38 mm.).

Habitat.—River Rouge in June; Canada; Maine; New York; Massachusetts: Minnesota; Wisconsin; Corfield, Vancouver.

This is the smallest of the species in average expanse, though specimens of *furcilla* run below it. It is most like a small *portlandia*, with all the teeth exaggerated and everything darkened. The tendency to darken the space between the median and transverse posterior line is quite marked in most specimens. This is the only species in which the orbicular is developed; but the dot which represents it is present in all the specimens I have had before me.

DEMAS Stephens.

Demas STEPHENS, Ill. Brit. Ent., Haust., 1829, II, p. 59.

Plump, yet somewhat slightly built species, with retracted head, very short thorax, long, cylindrical abdomen, and large, narrowly trigonate primaries.

Head strongly retracted, broader in the male than in the female, front flat. Tongue short and weak, useless for taking food. Palpi scarcely reaching the front and very slender. Eyes hairy. Ocelli very small and concealed. Antennae lengthily and heavily pectinated in the male, simple in the female; seeming short in proportion to the wings.

Thorax very short and weak, wider than long, collar and patagiae well marked, vestiture composed of flattened hair and scales, forming no tufts. The legs are short and stout, yet weak in proportion to the body, clothed with lengthy hair and scales. No armature, except the usual spurs, which are well developed and subequal.

Abdomen long, exceeding the anal angle of the secondaries in both sexes; longer and more cylindrical in the female. No tuftings.

The wings are of good size, large in proportion to the thorax. Primaries with the costa and inner margin arched so that the wing widens rather abruptly at base; outer margin oblique, arquate, the apices rectangular rather than pointed. Venation normal, except that the accessory cell is narrow, sometimes stalked beyond the cell, and occasionally wanting entirely. As a rule, 7, 8, 9, and 10 are very close together from the end of the small cell; when that is absent the stalk continuing the subcostal gives off in order 10, 7, 8, 9.

Secondaries proportionate, rather narrow, venation normal, save that 5 is as strong as any others and arises close to 4 from the median vein.

The genus is closely related to *Panthea*, and differs chiefly in the form of the primaries, which are less triangular, with more arched costa and more abruptly widened inner margin. The thorax seems yet smaller and more weak and the head more retracted, leaving the abdomen of disproportionate length, especially in the female. The antennae, especially of the male, seem unusually short, though this is less marked in *palata* than in the other species. In all, however, the pectinations are proportionately longer than in those of *Panthea*.

Three species are recognized as belonging here, *propinquilinea* and *flavicornis* being closely allied, while *palata* is very distinct.

Propinquilinea resembles *Panthea* in the form of the median lines, which are single and quite well marked; but the transverse posterior line is more normally and evenly bisinuate, and the median line is diffuse and obscure. Both ordinary spots are present.

Flavicornis looks much like the preceding, and has been confused with it. The median lines are much more slender and are connected in the middle of the wing, while the median shade line is altogether wanting. There are numerous other points of difference. but these will serve here.

Palata is the prettiest of all the species, with the vestiture smooth, the markings clear-cut, black, and slender, on a clean gray background, and the median space more or less black filled. The median lines are connected by a cross line, and the median shade line is more or less obvious.

There is no marked agreement or disagreement in the sexual characters, which are rather indefinite and without obvious type.

In tabular form the species are as follows:

ANALYTICAL KEY TO THE SPECIES OF DEMAS.

Median lines not joined or connected; median shade line distinct....*propinquilinea.*
Median lines connected:
  Markings obscure, grayish-powdery, not well defined; no median shade line. *flavicornis.*
  Markings black, sharply defined on a clear blue-gray ground; median shade line present; median space more or less black filled ....*palata.*

DEMAS PROPINQUILINEA Grote.

(Plates VIII, fig. 36, larva; IX, fig. 7, male; fig. 8, female adult; XIX, fig. 5, male genitalia.)

Charadra propinquilinea GROTE, Trans. Am. Ent. Soc., 1873, IV, p. 293, pl. I, fig. 96.
Apatela propinquilinea PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 499.
Demas propinquilinea SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 32.

Ground color white or nearly so, with brown and black powderings, giving the insect a dusty gray appearance. Head almost white, with a yellow tinge, while the male antenna is distinctly yellow. Collar with a vague dark shading centrally. Disk of thorax smoky posteriorly. Patagiae blackish at tip and with two narrow blackish bands. Primaries with all the markings blackish and fairly evident, though not prominent. Basal line traceable through the cell. Transverse anterior line broad, single, upright, or even inwardly oblique, with three feeble outcurves. Transverse posterior line very evenly bisinuate, outwardly denticulate on the veins, inwardly a little indefinite. Median shade broad, diffuse, almost rigidly upright, and may be nearest to either transverse anterior or transverse posterior line. It does not touch either in my specimens, and the median lines are not in any way connected. Subterminal line denticulate on the veins, a little irregular, but as a whole parallel to the outer margin; inwardly diffuse, outwardly defined by a white shading. A dusky terminal line is preceded by pale lunules, which are variably distinct in the specimens. The orbicular is round or nearly so, brown ringed, centered with the white ground color.

The reniform is very narrow, upright, and somewhat imperfectly brown ringed. Secondaries smoky, paler at the base, with a vague discal lunule and darker in the female. Beneath whitish, a little darker on the disk of primaries; secondaries with a smoky exterior band.

Expanse, 1.35 to 1.50 inches (34 to 37 mm.).

Habitat.—Kittery Point, Maine, June and July; Massachusetts in June; Rhode Island and New York, May, June, and July.

This species differs from *flavicornis* in lacking all connection between the median lines, and in this respect it resembles the species of *Panthea* much more nearly than those of *Charadra* or *Raphia*, which the other resembles in character of markings. There seems to be little variation, except in the relative distinctness of the maculation and a little in the distance between the median lines. As a whole the lower portion of the median space is a little the darkest part of the wing.

LARVA.

GOODELL, Papilio, 1881, 1, p. 15.—THAXTER, Papilio, 1883, III, p. 12.—A. K. DIMMOCK, Psyche, 1885, IV, p. 274.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 499 (*Apatela* sp. 45).—DYAR, Journ. N. Y. Ent. Soc., 1895, III, p. 130; Can. Ent., 1896, XXVIII, 103.

Stage VI.—As in the next stage; but a few red hairs from wart I the whole length, especially from joints 6 and 7. No black marks on the body except on joint 2. Width of head, 2.5 mm.

Stage VII.—Head shining red or blackish brown, pale on the clypeus; width, 4 mm. Body very variable in color, the ground white with numerous little transverse wrinkles of a more opaque white, and a white substigmatal band, depressed at the spiracles and sometimes broken or absent. Black shading usually begins at this band, bordering it above, spreading upward, especially in the incisures and below around warts VI, till the body may be nearly all black. Hair short, rather stiff, but not spinose, from distinct warts nearly in a transverse line; IV very small; no secondary hairs. Hairs white or yellowish; from wart II on joint 3, a red or black pencil; from wart I on joints 5 and 12, a red or black tuft, the pair forming a single tuft. Spiracles white.

This larva presents no good distinguishing characters from the European *Demas coryli*. In my European specimens the black shading seems to appear first dorsally rather than stigmatally, as in the American form, and a red tuft has persisted on joint 6; but I doubt the constancy of these characters.

Cocoon.—Thin and frail; a few threads spun between leaves.

Pupa.—Smooth, very shiny, the wing cases somewhat coarsely wrinkled. Abdominal segments regularly tapering, perfectly smooth, shagreened in the incisures. Cremaster large, thick, a little bulbous at the end, corrugated and wrinkled, with a series of hooks at the end as in *Charadra*.

Food plants.—Birch, walnut, maple, oak, beech.

DEMAS FLAVICORNIS Smith.

(Plates IX, fig. 9, male; fig. 10, female adult; XVI, figs. 2, 3, 4, venation; XVII, fig. 8, legs; XIX, fig. 6, male genitalia.)

Demas flavicornis SMITH, Bull. Bkln. Ent. Soc., 1884, VII, p. 3.
Demas propinquilinea SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 32.

Ground color a very pale dusty gray, on which all the markings are obscurely defined. Antennae of male yellow, head otherwise immaculate. Collar smoky tipped. Disc of the thorax smoky and patagiae with a smoky tip and cross band. Primaries with the ornamentation smoky and in very slight relief. Transverse anterior line narrow, single, almost upright or even inwardly oblique, with a single outward tooth below the cell to meet a similar process from the transverse posterior line. Transverse posterior denticulate and a little outcurved over the cell, then with a deep incurve to meet the spur from the transverse anterior line. The inferior inclosed median space is usually the darkest part of the wing. Subterminal line denticulate, parallel with the outer margin and shading insensibly into the palest ground color inwardly. Terminal space dusky, ending in a broken dusky terminal line, which is preceded by pale lunules. Orbicular round, brown ringed, with a pale center. Reniform narrow, upright, incompletely outlined in smoky. Secondaries thinly scaled; whitish in the female, blackish in the male. Beneath gray to smoky, with a vague outer line and discal spot.

Expanse, 1.10 to 1.75 inches (27 to 44 mm.).

Habitat.—Newark, New Jersey, in May; Albany, New York, May 12; Long Island, New York.

In this species the male is much smaller, darker, and more obscurely marked than the female. As a whole the space beyond the middle is distinctly paler than toward the base, and this, with the united median lines, will serve to identify the species.

In a general way this species resembles the *propinquilinea* of Grote, and I was so often informed in letters that my name was a synonym that I accepted the fact after an examination of Mr. Grote's material in the British Museum, in which only one form is represented. Comparing the true *propinquilinea* with the real *flavicornis*, side by side, proves them abundantly distinct, though both have yellow antennae. The sexual structures are also sufficiently distinct, so that my name must be reinstated. The range of this species is probably similar to that of *propinquilinea* and is certainly much greater than above given.

DEMAS PALATA Grote.

(Plate X, fig. 1, male adult.)

Charadra palata GROTE, Can. Ent., 1880, XII, p. 258; Papilio, 1881, I, p. 153.
Panthea palata SMITH, List Lepidoptera, 1891, p. 34.

Ground color whitish, densely powdered with black, thus giving the insect a very bright, blue-gray appearance. Collar and patagiae black tipped, and the disc of the thorax is also blackish. Primaries with the ornamentation black, the lines narrow and sharply defined. Basal line traceable. Transverse anterior line single, broader than the others, outwardly convex, but as a whole its course obliquely inward, the line being closer to the base at the inner than at the costal margin. Transverse posterior line slender, somewhat irregular in the upper portion of its course, as a whole inwardly oblique and rather feebly bisinuate. Median shade broad, diffuse, darkening the space between the ordinary spots, and lost in the dark shading in the inferior portion of median space. The median lines are connected by a black bar in the submedian interspace, and below this the space is blackish. Subterminal line slender, black, only a little irregular, and as a whole parallel with the outer margin. A dusky terminal line is preceded by a series of pale lunules. Orbicular moderate in size, upright, oval, black ringed and black centered; the intervening space gray. Reniform upright, somewhat lunate, black ringed, centered with gray. The transverse anterior line is preceded, the transverse posterior and subterminal are followed, by paler shades. A darker shading runs through the center of the subterminal space, best marked near the internal margin. Secondaries white in the male, dusky in the female. Beneath gray, secondaries white. On the primaries the markings of the upper side are vaguely reproduced; on the secondaries there is an exterior dark band and a discal spot.

Expanse, 1.35 to 1.55 inches (34 to 38 mm.).

Habitat.—Colorado; Arizona.

This is the brightest and prettiest of the species; easily distinguished by the clear black and white powderings, which give the insect a clean and neat appearance. It resembles *Raphia* in appearance as noted in the original description, but is best placed in *Demas*, though not far remote from *Panthea*.

CHARADRA Walker.

Charadra WALKER, Cat. Brit. Mus., Het., 1865, XXXII, p. 445.

Plump, well-developed species, with large though not prominent head, quadrate thorax and rather stumpy, yet amply developed primaries.

Head of good size, broad, distinct, yet not prominent; front hardly convex, yet scarcely flat; eyes large and widely separated; hairy; ocelli well developed and not concealed. Tongue moderately developed and useful for feeding. Palpi short and weak, hardly extending beyond the front so as to be visible from above. Antennae in the male rather short, lengthily pectinated; in the female, longer, very shortly pectinated.

Thorax fairly developed, almost quadrate, clothed with vestiture composed of flattened hair and scales, forming an indefinite little truncated posterior tuft. The collar and patagiae are distinct. The legs are well developed and of almost normal noctuid proportion to each other, though small in proportion to the insect. They are clothed with rather long hair, and are unarmed save for the usual spurs, which are short and weak.

Abdomen little or not at all exceeding the anal angle of the secondaries in the male, and not greatly exceeding it in the female. It is more or less conic in the male, more cylindrical in the female, and in both with a series of dorsal scale tufts which are very easily removed.

Primaries of good size, trigonate, and yet with a rather stumpy appearance, which is most strongly seen in *dispulsa*. The costal margin is hardly one-third longer than the inner, which is strongly curved toward base. The venation is quite normal.

Secondaries proportionate. Vein 5 quite as strong as the others and arising close to 4.

Altogether this is a strongly marked genus with an abundance of distinctive characters, not the least of which are the pectinated antennae of the female.

The genitalia of the male are of the same general type, with quadrate harpes, a long upper and a shorter lower clasper. They are quite complicated, however, and very different from each other; hence need not be further discussed here.

Three species occur, and of these I do not know *decora* Morrison. I have never seen the type nor do I know where it is. No collection known to me has a named specimen, and I suspect, from the description, that the insect does not belong to this series at all. The "simple" antennae—it is not stated whether of male or female—will serve to exclude it from this genus.

Deridens is somewhat the larger of the two species known to me, and has the markings black and sharply defined. The median lines are centrally connected and the ordinary spots are black centered.

Dispulsa is much paler and has a washed-out appearance. The median lines are slender and not in any way connected, while the ordinary spots are vaguely yellow and without trace of any dark centering.

In tabular form the two species appear so:

ANALYTICAL KEY TO THE SPECIES OF CHARADRA.

Markings black, sharply defined; median lines connected centrally; ordinary spots black centered .... *deridens*.

Markings blackish, not sharply defined nor contrasting; median lines not connected, ordinary spots yellowish, not dark centered .... *dispulsa*.

CHARADRA DERIDENS Guenée.

(Plates IX, fig. 12, male adult; XV, figs. 1, 2, antennae, male; XVII, fig. 5, legs; XIX, fig. 8, male genitalia.)

Diphtera deridens GUENÉE, Spec. Gen., Noct., 1852, I, p. 35, pl. III, fig. 8.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 36.
Charadra deridens GROTE and ROBINSON, Trans. Am. Ent. Soc., 1868, II, p. 86.
Acronycta circulifera WALKER, Cat. Brit. Mus., Het., 1857, XI, p. 709.—GROTE and ROBINSON, Trans. Am. Ent. Soc., 1868, II, p. 78, pr. syn.
Charadra contigua WALKER, Cat. Brit. Mus., Het., 1865, XXXII, p. 446.—GROTE and ROBINSON, Trans. Am. Ent. Soc., 1868, II, p. 86, pr. syn.

Ground color a creamy white, the ornamentation and powdering black. Antennae of male brownish. Collar with a central black band and inferiorly a little dusky. Patagiae with a black band and black tipped. Disc of thorax black powdered. Primaries with the ornamentation black and contrasting. Basal half line black, single, broken on the subcostal vein. Transverse anterior line black, single, bent on the costa and then almost upright to inner margin, giving off an acute outward tooth at its middle to meet a similar indentation of the transverse posterior line. Transverse posterior line single, black, slender, starting from a black blotch on the costa, beneath which it is sharply bent over the cell, denticulate on the veins and drawn in to meet the tooth of the transverse anterior line. Median shade diffuse, brownish rather than black, a little bent on the costa, and then evenly oblique between the ordinary spots to the inner margin. Subterminal line black, inwardly diffuse, outwardly defined by a white shade, very irregular but not dentate, best marked toward the margins and often quite vague centrally. There is a series of black terminal lunules, beyond which the fringe is dusky. Orbicular large, round, incompletely outlined, with a large central black spot. Reniform narrow, upright, best marked in black, outwardly. As a whole the basal space is well powdered, there is a clear shade before the transverse anterior line, the median space is quite clear except for the median shade, a clear shade follows the transverse posterior line, and this is bounded by a dusky area that sometimes becomes emphasized so as to form a dentate outer line. Terminal space moderately powdered. Secondaries smoky, somewhat paler basally; a dark line at the base of the fringes, which are whitish and cut with smoky. Beneath, primaries smoky on the disc, gray outwardly beyond a dusky outer shade; secondaries paler, gray, with an extra median dusky line and a discal lunule.

Expanse, 1.40 to 1.80 inches (35 to 45 mm.).

Habitat.—Canada south to Florida and Texas, west to Colorado. Canada in February; Kittery Point, Maine, June and July; Massachusetts in July; Evans Center and Sharon, New York, in July; "New York" in May.

This species is easily recognized by its large size, peculiar creamy tinged primaries and united median lines. The variation is confined to the amount and extent of the black powdering, and even in size the range is not great if the sexes are separately compared, the male being almost uniformly larger than the female.

LARVA.

Saunders, Can. Ent., 1870, II, p. 115.—Lintner, Twenty sixth Rept., N. Y. State Cab. Nat. Hist., 1872, p. 157, fig. 12.—Packard, Am. Nat., 1874, VIII, p. 692.—Thaxter, Papilio, 1883, III, p. 11.—Dimmock, Psyche, 1885, IV, p. 274.—Packard, Fifth Rept. U. S. Ent. Comm., 1890, p. 166.

Egg.—Hemispherical, with flat base and distinct vertical ridges, diminishing above and ending by becoming flattened to the surface of the egg near the micropyle; number, about 28. Reticulations distinct, rather square, a line at the vertex of each rib and one in each groove only slightly wavy; the cross reticulations forming the striae, all equally distinct. Reticulations smaller at the micropyle. Diameter, 0.9 mm.; height, 0.45 mm. Color pale whitish green, later with a black dot at vertex and a narrow concentric ring one-third the way down, irregular or broken.

Stage I.—Flattened, the legs spreading. Head rounded, whitish; width, 0.5 mm. Body whitish, green from the food; cervical shield reddish and a series of red subdorsal patches over wart II, very distinct on joints 3 to 7, entirely absent elsewhere. Warts many haired, the hair black and white, spinulose, the long ones smooth distally. Wart I with 4 hairs, II single, III with many hairs, IV absent, V single; no subprimaries. Skin spinulose, especially dorsally.

Stage II.—Head, 0.9 mm. wide, all pale whitish. Body whitish, food dark, against which a whitish subdorsal line is defined. Five dark-red subdorsal spots as before. Warts pale, large, and rounded, especially the subdorsal on joint 2, which is large and orgyia-like. All many haired; VI present. Hairs black and white. The red spots fade during the stage.

Stage III.—Head yellow, a black band over the eyes and another across at apex of clypeus; sutures of clypeus also black; width, 1.5 mm. Body whitish, broadly gray dorsally, with a central stripe, narrow subdorsal and broader lateral bands, all faint. Hair from distinct warts, short from I and II, long from the lower part of III and subventrally; wart IV nearly obsolete.

Stage IV.—Head black, a yellow band across the clypeus, trisected by the black sutures; width, 1.9 mm. Body all pale whitish, with long white hairs from the warts. Rests in a house of two leaves webbed together.

Stage V.—No change. Width of head, 2.5 mm.

Stage VI.—No change. Width of head, 3.5 mm.

Stage VII.—No change. Head shining black, rather densely fine hairy; three large yellow spots, one occupying the central part of the clypeus, the others on each side of clypeus, triangular, somewhat above the level of the eyes; width, 4.5 mm. Body whitish, immaculate, covered with tufts of long, fine, silky white hair from distinct warts; no secondary hairs. A few long black hairs grow from the stigmatal wart on joint 2. In another example, body grayish black, with a series of whitish dorsal spots on joints 7 to 11. Feet and venter pale; anal plate white. Warts pale gray; hair white.

Cocoon.—Thin, rather loose, with some floss silk on the inside. Spun between leaves.

Pupa.—Robust, smooth, and shining, dark brown, all the abdominal segments gently tapering, the consolidated anal portion somewhat more rapidly. Abdominal segments perfectly smooth, finely shagreened in the incisures. Cremaster large, a long thick cylinder slightly bulbous at the end, corrugated and wrinkled, bearing at the tip a curved series of numerous hooks, stout, the central ones longest and larger at the end than base, the apices completely recurved and overlapping.

Food plants.—Oak, birch, elm.

CHARADRA DISPULSA Morrison.

(Plates IX, fig. 11, female adult; XIV, fig. 2, head and thorax; XV, figs. 3, 4, antennae, male; XVI, fig. 5, venation; XIX, fig. 7, male genitalia.)

Charadra dispulsa MORRISON, Proc. Bost. Soc. N. H., 1874, XVII, p. 314.—HARVEY, Bull. Buff. Soc. Nat. Sci., 1875, III, p. 4.

Ground color white, with very fine black or brown powderings, often with yellowish tinge over all. Antennae of male brownish. Collar with a black band just below the tip. Patagiae black tipped and with a narrow black transverse band; disk of thorax also with black and yellow scales intermixed. Primaries with the ordinary lines slender, black, and not too well defined. Basal line feebly developed and scarcely traceable. Transverse anterior line slender, black, very little outcurved, and narrowing quite regularly from costa to inner margin. Transverse posterior line slender, very abruptly bent over the cell, and quite strongly incurved below. The median shade when best marked is evenly oblique, diffuse, and most evident costally; sometimes it darkens the space between the ordinary spots and at others it is scarcely traceable below the submedian fold, where there is a faint suggestion of a very slender dark streak uniting the median lines. Subterminal line vague inwardly and scarcely defined by a paler following shade; very irregular, but not dentate. There is a slender black terminal line which is sometimes broken. Orbicular round, moderate in size, often with a yellowish tinge, outlined by brown scales and with a brownish center. Reniform narrow, upright, yellowish, incompletely defined, with a dusky central line and sometimes followed by a yellowish shade. Secondaries smoky, paler at base; in the male paler, the smoky portion more confined to the anterior margin. Beneath, primaries smoky, paler toward base; secondaries whitish, with a more or less obvious outer line and discal spot.

Expanse, 1.37 to 1.50 inches (34 to 37 mm.).

Habitat.—Texas in March, May, June, August, and October.

This is a decidedly whiter species and smaller than *deridens.* The ornamentation is much less distinct and the median lines are not connected, though there is a vague suggestion of a very narrow line through the submedian interspace. There is the usual difference in the amount of the black powdering, which sometimes gives the median shade almost the dignity of a band; but otherwise my specimens indicate no variation.

CHARADRA DECORA Morrison.

Charadra decora MORRISON, Proc. Ac. Nat. Sci. Phila., 1875, XXVII, p. 55.
?Diphthera cavillator GROTE, Can. Ent., 1880, XII, p. 258.

This species has been described by Morrison, as follows:

> Expanse, 57 mm. Length of body, 23 mm. Eyes hairy. Antennae simple, black. Abdomen yellowish. Anterior wings white, with the usual markings black, wavy, and distinct; the ordinary lines are marked on the costa by heavy oblique black dashes; half line present; interior line strongly lobed; the orbicular spot black, figure-eight shaped, very conspicuous; median shade present; the reniform spot large, irregular, open above and below; the exterior and subterminal lines are drawn close together, forming wavy, irregular bands across the wings; at the costa and internal angle the subterminal line forms large black blotches; a series of short terminal black lines on the nervules; fringe white, checkered with black. Posterior wings pure white, with a single heavy oblique black dash at the anal angle. Beneath white.
>
> *Habitat.*—California.
>
> This large and beautiful species is closely allied to our three smaller Eastern ones. The white ground color, the peculiarly shaped orbicular spot, and the black mark at the anal angle of the posterior wings will serve to identify it.

This must be a striking species from the description; but I have seen nothing like it. No information is given as to what part of "California" is to be credited with this insect, nor is the name of the collector given. Mr. Grote states that the specimen is Central American, and suggests its identity with the *Diphthera cavillator* of the British Museum lists, but he does not make the reference definitely, nor does he state why he denies the Californian habitat of the species. I have little doubt that Mr. Grote is quite right in this matter, but have no material or evidence to verify his statements, and hence simply reproduce the description.

ACRONYCTA Ochsenheimer.

Acronycta OCHSENHEIMER, Schmetterlinge, 1816, IV, p. 62.

Species of moderately robust form, tending to become slight in the smaller species. Head not prominent, yet usually distinct, though tending to become sunken. Eyes naked and of good size, but not prominent; there are no lashes or fringes of hair at the orbits. The front may be somewhat conic, evenly convex, or very much flattened, the former occurring most obviously in the *americana* group, while the latter occurs most frequently in the group *auricoma* and reaches its climax in *oblinita* and its immediate allies. The flattening of the head is accompanied by a tendency to shorten and soften the tongue. The palpi are well developed though moderate in size, well clothed with scales, the second joint longest and stoutest, the terminal short and stumpy. As a whole, the palpi are oblique or curved upward on the front, on which they usually reach the middle, though in group *americana* the opposite is usual. Ocelli are distinctly present. The antennae are simple in both sexes.

The thorax is almost quadrate, rather small in proportion, and without distinct tuftings. There is a somewhat compact massing of scales posteriorly, overhanging the junction with the abdomen, but it forms no true tufting. The vestiture is a mixture of scales and scaly hair, varying somewhat so as to seem more hairy in the *americana* series and more scaly in the *lobeliae* group. The collar is sometimes a little uplifted, but not at all prominent, and usually lies closely applied to the body of the thorax. The patagiae are also applied to the body, so that in a well-preserved specimen at rest the thorax is evenly though somewhat feebly convex. The legs are moderately stout and proportionate, not spinulated or in any way armed except as usual on the tarsi, and with the spurs of the middle and hind tibiae normally developed. The tibial epiphysis of the fore legs varies somewhat in size and position, and in fact the range is as great as in the entire Noctuid family taken together, if we exclude the Deltoids. There is also a difference in the relative length of the various members, but nothing that is different from what may be found in allied genera. The fore wings vary in form from broadly trigonate to narrowly lanceolate, while the secondaries are proportionate, with an even outer margin. The outer margin of the primaries is also even, the fringes of moderate length, and never scalloped or even wavy. In some species of the *lobeliae* group there is a little tendency to form an obtuse angulation at about the middle of the primaries, but this is vague except in *falcula* and *parallela*.

The abdomen exceeds the hind angle of the secondaries, is rather long in proportion to the thorax, subequal and ending obtusely. There are no dorsal tuftings, but there is a loose mass of fine hair laterally at base. In the male the segments are marked laterally by projecting vestiture, which does not form positive tufts.

The venation offers nothing peculiar, and variation, so far as it has been found, seems to be individual or at most specific, and occurs only in that group originating from the end of the subcostal. Vein 5 of the secondaries is distinctly more weak than the others and arises somewhat nearer to 4 than to 6.

As a whole, the characters of the genus are negative. There is no distinctive feature, if we except the generally gray or white ground color and the tendency to the formation of *psi* markings on the primaries. This is not, in one sense, a structural character, yet ornamentation, when it is of a persistent type, is as much an anatomical fact as the development of other dermal outgrowths like spines or claws. The combination, then, which makes the species of this genus recognizable consists of the somewhat retracted head, rather short untufted thorax, rather long untufted abdomen, unarmed legs, simple antennae in both sexes, and white or gray primaries, in which there is usually a black basal dash and a streak opposite the anal angle, which may or may not cross the transverse posterior line.

It has been the habit to refer to this genus as one in which the adults are remarkably similar and offer no strong characters, while the larvae and even pupae afforded obvious and definite features for systematic purposes. These statements are made without knowledge of the structure of the insects and the amount of variation that actually occurs.

Mr. A. R. Grote, to whom we are indebted for the descriptions of several of our species of *Acronycta*, has also given us a number of lists and classifications in which generic and subgeneric names are applied to the groups and other divisions. These divisions are in the main based upon superficial appearance and resemblance and not upon structure or other characters of real systematic value. They were therefore incapable of accurate definition, and with one exception none of the proposed names can be used. In 1896 he published Die Apateliden as No. 3 of the Mittheilungen aus dem Roemer Museum in Hildesheim, and this is based upon larval characters supplied by Dr. Dyar and upon the published work of Dr. Chapman. No addition is made to our knowledge of adult structure and only the order in which the species are arranged is original.

As a matter of fact, the species of *Acronycta* afford excellent characters for groupings in the adult stage, and this is only what we should expect. It is unquestionably true that there may be independent variation in the larval stage, necessitated by the environment, but it is equally true that there can be no variation in any important structural or anatomical detail which will not also be marked in the adult. I am not so certain that the opposite is true, however, and am inclined to believe that structural differences in the adult may exist without obvious effect on the early stages. I am not inclined to fully agree with Dr. Scudder that genera are as easily traced in the larva as in the imago, and rather believe that, while adaptive or protective variation may occur in the early stages without effect upon the adult, all anatomical differences originate in the adult. Variation in the adults is also determined very largely by environment, and this is particularly true of adaptive variation. It is quite conceivable that real changes of structure may have taken place which are not in the least indicated by the superficial appearance. This, indeed, has happened in *Acronycta*. The species as a rule rest during the day openly upon the trunks and branches of trees, or upon stones, and their colors and markings are well adapted to harmonize with such surroundings and to render the resting specimen invisible. So long as this imaginal habit persists there is not much likelihood of any change in the general character of the ornamentation whatever changes might take place in other directions.

The organs that are most likely to be first affected are those of reproduction, and in the *Noctuidae* at least those of the male seem particularly sensitive. I am not ready to claim that this is a rule, because our knowledge of the life history of our species and of the larval structures is too incomplete, but it is certainly true in *Acronycta*. A good species is certain to have specific peculiarities in all its stages, and if we do not discover them the fault is with us. Any sound system of classification based on one stage will harmonize with that built upon any other, provided that the facts are rightly interpreted. If we accept evolution as a fact it simply can not be otherwise, since all changes must have acted upon the species as a whole, and larval characters could not be continued unless the resulting adult was in turn affected.

We find, therefore, that if we examine the genitalia of the male in *Acronycta*, the proposed classifications of Chapman and Dyar, based upon pupae and larvae, are fully confirmed, and that even more divisions are indicated by this character. Dr. Chapman finds two very distinct pupal types. Dr. Dyar finds four series in the larvae, of which two are not sharply defined. In the adults there are five distinct genitalic types and a sixth that, while recognizable, leaves a few intermediate species unplaced. Unfortunately, too few of the larvae are known to make our classification correspond completely, but there is no reasonable doubt that our further knowledge will result in the discovery of characters that will associate all those forms agreeing in genitalic structure. It is interesting to note here that while excellent group characters are obtainable from these sexual structures, they are not of much specific importance in this genus, because all the species of each group resemble each other quite closely in this particular. The group of which *lobeliae* is typical varies most, and it is from this that modifications seem to radiate.

Five groups in this genus may be typified by *americana*, *lobeliae*, *persuasa*, *hamamelis*, and *auricoma*, respectively.

Group *americana* is well characterized by having, in the male, very broad harpes or sidepieces, from almost the middle of which there arises a long, curved, chitinous process. This process seems to arise directly out of the membranous structure, and is not set on a chitinous ridge or other separate strengthening process from the base. Superficially the species agree in trigonate primaries, in which the outer margin is long and evenly curved to the somewhat prominent apex. The maculation, while complete in some cases, tends to become broken up into blotches, and the *psi* marks are rarely prominent. The palpi are shorter than in any other group and hardly reach the middle of the front, which in the species of this series tends very strongly to become conical and somewhat prominent. The thoracic vestiture is decidedly less scaly than in the other groups, and in some cases consists almost entirely of long, very narrow, flattened hair. Altogether this group is fairly well marked.

In group *lobeliae* the harpes are very slender and long and the claspers are broad and entirely separated from them, except at the base. The individual clasper is long, broad, becoming scoop-shaped toward the end, and at the upper angle of this scoop a finger of varying length and curvature is developed. In many cases another finger-like process arises from the middle of the upper margin and projects at right angles to it. This structure is accompanied by much less trigonate primaries than was found in the previous group. They widen more abruptly on the inner margin, which is more nearly parallel with the costa, and the outer margin is much shorter, more bulging centrally, and meeting the costa in almost a right angle.

Almost all the species in which this structure is typical have a more or less obvious basal dash, a distinct dash usually forming a *psi* opposite the anal angle, often a dash opposite the cell and sometimes a black line connecting the ordinary spots. The vestiture in such cases is smooth and even. The first obvious superficial change is in the character of the vestiture, which becomes roughened, while the scales on the primaries tend to become elevated. The typical markings become obscured and the male organs emphasize the departure by changing the form of the scoop of the clasper into a flat plate, then to a more cylindrical, spear or beak shaped process, while the superior process becomes in some cases dominant. In another direction, while the maculation is at first powdery the vestiture remains normal, and indeed becomes much more smooth and even, while the dashes and psi marks are reduced and become much less prominent.

It is in this group that the greatest difficulties in arranging the species are experienced, because of these several branchings, which will not fit into any linear series.

Group *persuasa* is an offshoot from the previous group through *brumosa*. The clasper is broad, flattened, chitinous, united superiorly to the inferior margin of the harpe, furnished at the upper angle of tip with a longer or shorter, more or less curved corneous process, and at the middle of the upper margin with a finger-like, upright process. All the species agree in these characters.

Superficially the group is characterized by moderately trigonate primaries, though they tend to vary, but all the maculation is obscured and tends to become blotchy. A prominent, pale, round orbicular, with a central dusky spot, is a characteristic feature and sometimes the only contrasting mark. The vestiture is extremely rough in most of the species.

Group *hamamelis* is characterized by the comparatively small, beak-like clasper, which arises from an oblique thickening on the harpes and near their center. Superficially these species are characterized by the arched costa of the primaries, which broadens them near the base and makes the inner and costal margins almost equal in length, the outer margin being short and the apices almost rounded. Here also the vestiture is distinctly roughened in most of the species.

Group *auricoma* contains forms in which the male clasper forms a chitinous thickening at the base of the sidepiece, usually separating beyond the middle and forming a straight inferior process and a curved and more slender superior hook, the two diverging from an acute angle. The variation is in the proportion of these two processes, the lower of which tends to obsolescence.

Superficially the species divide into two series, one of which is characterized by short, stumpy primaries, with the maculation of the *persuasa* group, the other by long subequal or almost lanceolate forewings, derived out of the *tritona* type of the *lobeliae* group. We have also, in the second series, an obvious tendency to a flattened or even retreating front, accompanied by a weakened tongue.

We find, therefore, a diversity of structure in the adults relatively as great as any that occurs in the larvae, and that, similar as the species may seem at first sight, they are so in reality only to him who is content to look at the surface, in dread of disarranging a scale lest the specimen should become thereby less desirable for the cabinet.

The synonymy has been worked out as carefully as possible and is believed to be correct, though it differs from any heretofore proposed in some respects. None of the Guenée or Walker types have been actually compared by the authors, but Dr. Riley's notes contained memoranda of nearly all the species represented in the British Museum, and Dr. Butler's notes on the same specimens were also of much use. Each description was carefully compared, however, and specimens fully agreeing were in all cases secured. The names heretofore not identified from the "Species General" have all been applied, and here the references to the early stages have in some instances decided the question as to what was really intended.

SYNOPSIS OF GROUPS.

Primaries well developed, trigonate, outer margin oblique, apices somewhat drawn out; all the markings usually normal, but tending to break up into spots or blotches on the transverse lines, which are often marked on the costa only; *psi* marks not prominent.................. Group *americana*.
Primaries rather abruptly widening on inner margin at base, less obviously trigonate, outer margin arcuate, the apices rectangular, or even a little rounded.
    Vestiture smooth, the markings not picked out by elevated scales; the dagger marks prominent.. Group *lobeliae*. §
    Vestiture rough or squamose, the markings picked out by elevated scales.
        Psi marks evident, wing form as in *lobeliae*................ Group *lobeliae*. §§
        Psi marks wanting or barely indicated, primaries trigonate, apices rectangular; broader than in *lobeliae* in proportion to length .... Group *persuasa*.
        Psi marks present or wanting, costal margin arcuate, the primaries widening abruptly near base and subequal.................. Group *hamamelis*.
Primaries short, trigonate, stumpy in appearance, or long, narrow, subequal or lanceolate .... Group *auricoma*.

GROUPS ACCORDING TO GENITAL STRUCTURE.

Lateral clasper a single, long, curved hook, arising abruptly from the harpes. Group *americana.*
Lateral clasper scoop shaped, with a projecting long upper angle; with or without a finger-like process from upper margin.................Group *lobeliae.* §
Lateral clasper flat, with a long projecting angle and a finger-like process from upper margin...Group *persuasa.*
Lateral clasper beak like, with or without a superior process; arising separately from harpes.......................................Group *lobeliae.* §§
Lateral clasper hook or beak like; arising from an oblique thickening at the middle of the harpes.......................................Group *hamamelis.*
Lateral clasper a slender claw, hook or process above, and a short, stout, inferior process, somewhat like a short thumb and a long curved forefinger. Group *auricoma.*

GROUPS ACCORDING TO LARVAL STRUCTURE.

Warts small, few haired; secondary hair predominant.............Group *americana.*
Warts small, secondary hair subordinate, always present at least slightly. Group *lobeliae.*
Warts small or single haired; no secondary hairs................{ Group *persuasa.* Group *hamamelis.*
Warts large, functional; no secondary hairs........................Group *auricoma.*

Group AMERICANA.

1. All the maculation distinct; ordinary spots well defined; median lines geminate, transverse anterior scalloped, transverse posterior denticulate; secondaries yellowish in both sexes..................................*rubricoma.*
Maculation more or less incomplete; median lines never both geminate, transverse anterior line not scalloped, and transverse posterior line not so strongly denticulate; secondaries various.............................. 2.
2. No longitudinal basal dash, line, or streak.................................. 3.
A longitudinal black basal line, not divided at tip and not joined to the transverse anterior line, which is absent or marked on costa only.......... 4.
Basal dash very short, not reaching to the transverse anterior line, which is often indicated on the submedian interspace by an angulated mark.. 7.
Basal dash or streak extending to the transverse anterior line, or to the angulated mark indicating it.. 8.
3. Secondaries smoky in both sexes; median lines and ordinary spots fairly well marked; transverse posterior line geminate; size very large..*americana.*
Secondaries yellowish white in male, smoky yellow in female; primaries with an ochreous tinge, best marked in male; dagger mark opposite anal angle sharply defined and crossing the transverse posterior line. *hastulifera.*
Secondaries grayish white in male, smoky gray in female; primaries bluish ash-gray; dagger mark opposite anal angle is but vaguely indicated and does not cross the transverse posterior line..................*hesperida.*
Secondaries white in male, smoky gray in female; primaries ash-gray; dagger mark opposite anal angle well marked and usually crosses transverse posterior line..*dactylina.*
4. Primaries dark blue-gray, densely black powdered .... 5.
Primaries paler ashy gray, black powdering more sparse.......................... 6.
5. Ordinary spots and median lines usually wanting; veins slightly darker, giving a somewhat strigate appearance; transverse posterior line sometimes well defined as a narrow pale band..............................*felina.*

Ordinary spots always discernible, sometimes well marked; transverse posterior line well defined and even .... *frigida.*

6. Darker, the black powderings evenly distributed, veins somewhat smoky, giving a strigate appearance; transverse posterior line continuous, without blotchy marking .... *pacifica.*

More whitish, the black powderings irregularly massed, veins not so marked as to give a strigate appearance; transverse posterior line broken, with blotchy black markings .... *insita.*

7. Chalky white, black powderings very fine; ordinary spots well marked; transverse anterior line marked on costa, internal margin, and in submedian interspace; transverse posterior line interrupted and blotchy; dagger mark prominent and crosses transverse posterior line opposite anal angle .... *cretata.*

White, with a faint creamy tinge; markings as before, but less prominent; powderings much less evident .... *leporina.*

Grayish white, more evenly black powdered; orbicular absent; dagger mark not distinct and does not cross transverse posterior line opposite anal angle .... *populi.*

8. Transverse anterior line incomplete, but usually present in part .... 9.

Transverse anterior line complete, geminate .... 10.

9. White, with a creamy tinge, primaries rather sparsely powdered; orbicular distinct .... *lepusculina.*

Ashen gray, primaries quite densely powdered with coarse black scales; no median shade line .... *cinderella.*

Ashen gray, as before, but with an evident, smoky, angulated median shade line or band .... *transversata.*

10. Primaries dark bluish gray; transverse anterior line almost upright, its two parts almost equally distinct and quite widely separated; size smallest of the group .... *tota.*

Group LOBELIAE.

1. No black basal dash, line or streak and no black dagger marks of any kind .... 2.

A black basal dash, streak, or line present in all cases; one or more dagger marks usually present .... 3.

2. Ground color creamy white; costal marks and transverse posterior line black. *innotata.*

Ground color luteous, the maculation but little darker and none of it black. *betulae.*

3. The ordinary spots are more or less obviously tied or connected by a black line or dash .... 6.

The ordinary spots not connected by a black line or dash.

Scaly vestiture of primaries smooth, decumbent .... 4.

Scaly vestiture of primaries elevated, rough, giving the surface a more or less velvety appearance .... 15.

4. Maculation strigate, all the ordinary lines and spots obscured .... 9.

A more or less obvious black mark or dagger line touches or crosses the transverse posterior line opposite the cell .... 5.

No trace of a dagger mark or black line opposite the cell of primaries .... 10.

5. Dorsum of the thorax discolorous, yellow, primaries creamy white with yellow shadings, secondaries smoky; size large .... *morula.*

Dorsum of thorax concolorous.

Size moderate, primaries ashen gray, no median shade line; all the dashes distinct and the markings well defined .... *occidentalis.*

Size small, primaries with a more or less obvious median shade line.

Ashen gray, with a slight reddish tinge; opaque; the dash opposite anal angle usually crossing the transverse posterior line.... *paupercula.*

Glistening or shining white, with mossy olivaceous or bluish shadings; anal dagger usually not crossing the transverse posterior line. *vinnula.*

Smoky or blackish, the maculation white; median lines very strongly dentate .... *fragilis.*

6. Primaries creamy white, a little shining, powdered with fine brown atoms; secondaries smoky yellow .... *laetifica.*

Primaries ash or bluish gray.

Dorsum of thorax concolorous; transverse markings normal.......... ....7.

Dorsum of thorax discolorous, yellow; maculation strigate..........8.

7. Secondaries smoky yellowish in both sexes.

Largest of the series; expands 1.75 to 2 inches; all the black marks and dashes prominent and contrasting, the basal dash usually crossing the transverse anterior line.......... *lobeliae.*

Expands not to exceed 1.75 inches.

Deep ash-gray, with a smoky tinge; secondaries smoky yellow in both sexes.......... *furcifera.*

Paler ash-gray, a little mottled in appearance; secondaries white, with a faint smoky shading .... *hasta.*

Bluish ash-gray; maculation tending to become strigate; secondaries pure white.......... *manitoba.*

8. Primaries gray, with a faint ocherous suffusion; all the ordinary spots and lines traceable; secondaries with a faint smoky tinge.......... *thoracica.*

Primaries blue-gray, without suffusions; the ordinary spots and lines scarcely or not at all traceable; secondaries pure white.......... *strigulata.*

9. Primaries dark ash-gray, with a smoky suffusion; secondaries with a yellowish tinge, which is best marked in the male .... *lithospila.*

10. Internal margin of primaries darkened by a black shading from base below the dash to the transverse posterior line .... 14.

Primaries uniformly gray; not darker along inner margin .... 11.

11. The dagger opposite anal angle crosses the transverse posterior line.......... 12.

The dagger opposite anal angle does not cross the transverse posterior line.. 13.

12. Very dark, even, blue-gray, the maculation obscure, except for the dashes and transverse posterior line; transverse anterior line scarcely traceable .... *tritona.*

Ash-gray, powdery, all the markings evident.

Darker and larger; space beyond transverse posterior line smoky, dagger mark opposite anal angle very heavy; secondaries soiled whitish in both sexes.......... *revellata.*

Smaller and paler, a little marbled in appearance; dagger mark opposite anal angle more slender; secondaries white, only a little soiled in both sexes .... *grisea.*

Very even, ash-gray, without contrasts and with all the markings slender and neatly written; secondaries white in the male, smoky in the female .... *radcliffei.*

13. A quadrate black patch on primaries between the ordinary spots...... *quadrata.*

No marking between the ordinary spots.

An orange shading at base below the black dash; secondaries white in the male, soiled with gray in female.......... *falcula.*

No orange shadings at base; secondaries white in both sexes, a little soiled outwardly in female.......... *parallela.*

14. Bluish gray; the dark shading along inner margin is diffuse, not defined, and does not extend upward on the transverse anterior line....... *mansueta.*

Bluish white, the dark shading along inner margin is black, sharply defined, and extends upward so as to form a tooth on the transverse anterior line .... *funeralis.*

15. A dark longitudinal shade extends through the middle of the primaries...... 16.

Primaries without such a dusky central shade.................................... 17.

16. Smaller, smoky gray, a little suffused with luteous in the cell; not mottled or marbled .... *connecta.*

Larger, ashen gray, a transverse as well as longitudinal dark shade giving the primaries a marbled or mottled appearance................... *superans.*

17. Very dark, powdery ash-gray; none of the dashes well marked; all the lines geminate, but obscure; secondaries smoky yellow, darker in the female .... *brumosa.*

Paler ash-gray; at least the basal dash well marked.

The dashes neatly defined; that opposite anal angle not diffuse... *spinigera.*

The dashes diffuse; that opposite anal angle thick and not sharply defined. *pruni.*

Group PERSUASA.

Almost entirely black; the orbicular white, round, contrasting, with a central dot; all other maculation obscured.. *afflicta.*

Very dark ash-gray, mottled with black; all the maculation traceable, but, except the orbicular, not contrasting.. *persuasa.*

Dark ashy gray, more evenly washed with smoky; the black shadings tending to become strigate.. *liturata.*

Ground color bluish white; all the markings black, so that the primaries appear marbled .... *marmorata.*

Group HAMAMELIS.

Dagger mark opposite anal angle usually distinct, always traceable.

Secondaries of male white; ground color of primaries even, dark blue-gray, ordinary spots shaded with reddish; vestiture scarcely roughened, even of the ornamentation.. *albarufa.*

Secondaries smoky in both sexes.

Yellowish gray, the reniform yellow shaded; basal dash distinct, black, connecting with an inward angulation of the transverse anterior line, which is broadly black marked and so formed as to include an ovate basal space above the streak .... *ovata.*

Essentially with markings as before, but the basal dash is linear or scarcely traceable and the transverse anterior line is not black marked; size smaller .... *modica.*

Uniformily ash-gray, the geminate transverse anterior line evenly oblique, and the dagger mark opposite anal angle tending to disappear in the male.. *clarescens.*

No dagger mark opposite anal angle; at most a diffused shading that suggests its presence.

Expands more than 1.25 inches; ground color varies from ashen gray to blackish smoky; the markings either distinct and contrasting or barely traceable.. *hamamelis.*

Smaller and of a much more evenly dark ground color; does not exceed and rarely reaches 1.25 inches in expanse............................... *increta.*

Size as before, but ground color of a pale, whitish gray................. *retardata.*

Group AURICOMA.

1. All the ordinary maculation present, but not contrasting; no longitudinal streaks, dashes, or dagger marks; primaries elongate, subequal .... 2.

All the ordinary maculation present, more or less mottled and contrasting, tending to suffusion; primaries short and trigonate .... 3.

The ordinary maculation more or less obscured, tending to become more distinctly strigate; wings long, trigonate, tending to or becoming lanceolate ... 4.

2. Dull gray, with dense black powderings obscuring the maculation; secondaries grayish white .... *illita.*

Brighter gray, primaries with sparser powderings and all the maculation clear; both wings with a yellowish suffusion, most marked in secondaries. *luteicoma.*

3. Even, pale, powdery gray, without a black basal dash or streak, and with no contrasting maculation .... *sperata.*

Marbled black and white; the maculation contrasting .... *noctivaga.*

Primary gray, more or less mottled; basal black streak present.

Dark bluish gray, the maculation not prominent; secondaries soiled white in the male, smoky gray in female .... *emaculata.*

Paler gray, with a slight yellowish tinge on both wings, the markings well relieved and the primaries, therefore, with a mottled appearance.

Somewhat broader winged and the primaries less pointed at tip; transverse anterior line in female always well marked .... *impressa.*

Narrower winged and the primaries more pointed at tip; transverse anterior line in female obscured by a dusky shading which extends from base to the anal angle .... *distans.*

4. The primaries so strigate as to appear blackish and the transverse maculation obscured .... 5.

The primaries ash-gray, not prominently strigate; transverse maculation distinct; an obvious dagger mark opposite the anal angle .... 6.

The primaries almost white, with black powderings, in form lanceolate and without a dagger mark opposite the anal angle .... 7.

5. All the maculation obscured, and only the reniform sometimes traceable. *barnesii.*

Transverse posterior line fairly evident and lunulate; secondaries of female dusky .... *perdita.*

Transverse posterior line evident and very strongly dentate; secondaries white in both sexes .... *edolata.*

6. A distinct black basal streak; transverse anterior line obscure or wanting; transverse posterior line strongly denticulate .... *extricata.*

No black basal streak; transverse anterior line usually evident; transverse posterior line not strongly denticulate .... *xyliniformis.*

7. Grayish white, powdery; transverse posterior line lunulate; a series of black terminal dots .... *oblinita.*

Bluish white, less powdery in appearance; transverse posterior line an even, continuous brown shading; no black terminal dots .... *lanceolaria.*

Group AMERICANA.

The species united in this group find their most important common feature in the sexual characters of the male. In all cases the harpes or sidepieces are broad, rounded at the tip, and the clasper consists of a single long hook, which arises directly out of the membranous sidepiece much nearer to the base than to the middle. There is hardly any material variation in this plan of structure, and, while there are differences, they are merely specific; indeed, they can not be used satisfactorily for even specific separation, because in closely allied species the structures are so similar as to be within the range of possible variation.

Superficially the group is distinguished by the well-developed, trigonate primaries, in which the outer margin is long, oblique, evenly curved, and the apex is pointed. Yet the wings are never lanceolate or tending to that form. None of the species have the *psi* or dagger marks strongly developed, though in most instances that opposite the anal angle is at least indicated. The markings are of one general type and, while all present, tend to become broken and blotchy. While there is no distinctly roughened vestiture, yet there is throughout a powdery appearance which is quite characteristic, and which, with the wing form, makes it fairly easy to determine the group.

There is no uniformity in the structure of the male foreleg, yet the tendency is to locate the tibial epiphysis below the middle and extending to the tip.

Separated from all the other species by having all the maculation distinct and the median lines geminate is *rubricoma*. It is rather a variable form and narrower winged than the others. There is little contrast in the maculation and in most cases the lines can hardly be called even blackish. The species varies in size and may be either clear ashen gray, or may have a yellowish smoky suffusion throughout. When the gray and the yellowish forms are separated they seem quite distinct; but there are specimens that may be with equal propriety placed in either series; hence it is not safe to give even a varietal name.

The balance of the species may be separated into two series according as there is or is not a basal black streak, line, or dash.

In the first series no such line, streak, or dash exists, and of this *americana* is characteristic. This, the largest species of the genus, is really very much like *rubricoma* save that the markings become much less definite, and the transverse anterior line tends to obsolescence. The transverse posterior line, while it is dentate, is not nearly so well marked in this particular as is *rubricoma*, and finally, besides being the largest in the genus, the secondaries are uniformly smoky brown in both sexes, though much darker in the female. It is also remarkable for the extremely well-developed anterior femora in both sexes.

Hastulifera is a smaller species, of a somewhat paler gray, soiled with a yellowish suffusion, most obvious in the male, which is otherwise decidedly paler in color than the female. In the secondaries the same yellowish shade obtains, but those of the female are much darker and smoky. The difference between the sexes in this species is quite marked and much more obvious than elsewhere in the group. In all the specimens I have seen there is a distinct though slender dagger mark crossing the transverse posterior line opposite the anal angle.

Hesperida is a new species, from the Pacific coast, which has been mistaken for *dactylina*, and perhaps for *americana* in some cases. It is almost as large as *americana*, but is of a bluish ash gray, very densely powdered with black scales. The secondaries in the male are white, with a faint, smoky gray tinge, and in the female they are gray powdered. As a whole, the female is darker and larger than the male, but the difference is not nearly so striking as in *hastulifera*. The *psi* mark, opposite the anal angle of primaries, is barely indicated by a diffuse shading which does not cross the transverse posterior line.

Dactylina is of a bright bluish gray, powdered with black atoms, but not so densely as in the preceding, than which it seems, therefore, decidedly paler. The secondaries are white in the male and grayish, powdery in the female. The *psi* mark, opposite the anal angle of the primaries, is distinct and crosses the transverse posterior line.

Of the species in this series it may be said, in recapitulation, that *americana* is distinguished by its large size and very dusky secondaries. *Hesperida* is almost as large, but is blue gray, the secondaries are nearly white in the male, and there is no *psi* mark crossing the transverse posterior line opposite the anal angle of primaries. *Hastulifera* and *dactylina* both have the *psi* mark, but the former has a distinct yellowish shade in both sexes, and smoky secondaries in the female, while the latter is bluish gray and powdery, and the secondaries of the female are gray. As between the males of these latter species there can rarely be doubt. As between the females some forms of *dactylina* can be separated from *hastulifera* only by the secondaries.

In the series in which there is a black basal dash, streak, or line three subdivisions are recognizable: First, where the basal streak is linear, terminating acutely and extending to the point which would be occupied by the transverse anterior line were it present; second, where the basal streak is very short and does not reach the point where the transverse anterior line is or might be marked—in this case it is quite usual to have the transverse anterior line marked in the submedian interspace by an angular mark; third, where the basal dash or streak reaches to and joins the transverse anterior line or the angular mark which invariably indicates it. This basis for subdivision seems at first sight to be rather slight, but a large series of specimens of each species proves that it holds good. There are cases, of course, where a specimen may at first seem doubtful, but such are usually due to an imperfection in the example or to an aberration which is rarely the same on both wings.

In the first subdivision, where the streak is slender and the transverse anterior line is wanting, there is a tendency to a strigate type of maculation. In *felina*, which is a very dark blue-gray, all the transverse maculation is lost, save that the transverse posterior line may be present as a paler shade. The other lines are rarely even indicated on the costa and the ordinary spots are practically wanting. There is no dagger mark opposite the cell.

Frigida is a close ally of and has been mistaken for *felina*. It is somewhat broader winged, however, has the transverse posterior line at least indicated and usually distinct, the reniform evident, the orbicular at least traceable, and there is an evident dagger opposite the cell, crossing the transverse posterior line. The basal dash may extend through the submedian interspace so as to connect with the *psi* mark opposite the anal angle.

Pacifica is a smaller, narrower winged species, and is more ashen gray and more powdery. The transverse posterior line is distinct, while the transverse anterior line and median shade are marked on the costa. The reniform is vaguely lunate; the transverse posterior line is emphasized opposite anal angle and vaguely so opposite the cell, thus leading to the *leporina* type.

Insita continues this tendency. It is a paler blue-gray, the powdering is more sparse and seems coarser, while the transverse posterior line is broken and marked diffusely opposite the cell and the anal angle. The transverse anterior line and median shade are distinctly marked on the costa and the reniform is reduced to a somewhat obscure dusky lunule.

In the second subdivision, where the streak is very short, *cretata* is pure chalky white, with very fine black powderings on the primaries. The ordinary lines and median shade are prominently marked on the costa, the reniform is an obvious black lunule, and the broken transverse posterior line is marked opposite cell and anal angle, at which latter point a *psi* is distinctly formed.

Leporina is like the preceding, but the primaries have a faint creamy tinge and are less powdered. The maculation is less prominent, and the *psi* opposite anal angle is wanting or diffuse. In *cretata* the anterior femora are much stouter and comparatively shorter than in *leporina*. This is the only species of *Acronycta* common to Europe and North America, and our larvae are absolutely like those compared from Europe.

Populi is more grayish white, with the powderings more evenly distributed over the entire wing. The type of maculation is as in the preceding species, but everything is diffuse. The orbicular is absent and there is no black line or dagger opposite the anal angle.

In the third subdivision, where the black basal streak reaches to the transverse anterior line, the first species is *lepusculina*. This is like *populi* in markings, but the orbicular is always present, the transverse anterior line is often traceable, and there is a distinct dagger crossing the transverse posterior line opposite the cell. The question as between *lepusculina* and *populi* is settled, therefore, by retaining both names. Guenée and Riley both confused the species, and Guenée's description covers both forms. The form bred by Riley and since that time by others is that which I have here called *populi*.

Cinderella is more ashen gray and the powdering is more coarse and more dense. The markings are much as in *lepusculina*, but the color is darker, the transverse posterior line is continuous, and there is much less contrast.

Transversata is much like the preceding, but there is an evident median shade line crossing the wing through the outer part of the median space and reaching the inner margin at about its middle. It is the only species so marked in the group and hence easily recognizable.

Tota is the smallest of this group and unique in its uniform dark blue-gray primaries, and the very distinct, even, geminate transverse anterior line. Both parts of the transverse anterior line are equally well marked and they are well separated. There are no dagger marks and the ordinary spots are well outlined.

The only European member of this group, other than *leporina*, known to me is *aceris* and its variety *candelisequa*. The sexual structure is in full accord with that of the American species, and in superficial appearance it is nearest to some of our large specimens of *rubricoma*, standing somewhat intermediate between that species and *americana*.

ACRONYCTA RUBRICOMA Guenée.

(Plates I, fig. 4, adult; VI, figs. 14, 15, larva; XV, fig. 10, head; XVII, fig. 9, leg; XVIII, fig. 12, tarsal claw; XIX, fig. 10, male genitalia.)

Acronycta rubricoma GUENÉE, Spec. Gen., Noct., 1852, I, p. 49.
Acronycta acericola WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 57.

The ground color is somewhat luteous gray; the yellow tinging sometimes faintly visible, sometimes very prominent. The head and thorax are powdery, the collar a little darker at the tip, and the edges of the patagiae somewhat dusky tipped, though this is a variable character. The primaries are well powdered with black atoms, which give them a roughened appearance. Sometimes the powdering is quite evenly distributed. Occasionally it is more distinctly massed at the base and a little beyond the transverse posterior line, and quite frequently there is a more or less complete median shade which crosses obliquely from the costa over the reniform and is rarely traceable below that point. The median lines are geminate, and in well-marked specimens they are all distinct. The basal line is also geminate, sometimes marked on the costa only, sometimes distinct to a narrow, blackish, longitudinal line which extends from the base to the transverse anterior line. The transverse anterior line is blackish, as a whole outwardly oblique, and irregularly dentate and lunulate. The transverse posterior line is very strongly lunulated, so that it is outwardly dentate on the veins. The outer part of the line is usually more distinct than the inner, and the included shade is paler than the ground color; sometimes almost white. There is no distinct subterminal line; but sometimes this is indicated by a slight difference in shade in what may be called the terminal space. There is a series of blackish terminal dots beyond which the fringes are cut with brown. The orbicular is round; of moderate size, ringed with blackish, sometimes with a discal dot and occasionally entirely suffused. The reniform is large, kidney shaped, rather well defined in most specimens, but often obscured by a dusky shade.

There is a vague dusky shade in the submedian interspace from the transverse posterior line outward, which represents the ordinary *psi* mark. Occasionally this is fairly distinct and sometimes we have a more or less obvious streak, which crosses the transverse posterior line. The secondaries are whitish, with a faint yellowish tinge in the male, darker and a little smoky in the female. There is usually a vague discal dot and a discal outer line, which are rather a reflection of what is found on the under side than a distinct marking of the upper surface. Beneath the color varies from white to yellowish smoky, in all cases with a more or less obvious discal dot and an outer shade line on both wings.

Expanse, 1.25 to 1.80 inches (31 to 45 mm.).

Habitat.—Long Island, New York, March 6; Washington, District of Columbia, April 28, July 10, September 3; St. Louis, Missouri, March 3; Texas, April 11 and 21, August 12. Occurs throughout the Middle and Southern States and has been found in Canada.

This insect varies remarkably in size, and this seems to be, to some extent at least, due to locality, for all my large examples are from Texas, while the smallest are from Long Island. Some of the latter seem to be bred specimens, and it may be that this is in some measure responsible for the small size. At first sight it almost seems as if the species could be divided into two by the ground color, because the larger specimens are more generally shaded with yellow; but nothing in the structure or markings will authorize the separation even into varieties. The original description of the species fits best to the well-marked specimens from the southern range of the species. The head is usually distinct: the front is prominent and a little conical. The clasper of the male genitalia is moderate in size, quite stout, and not very strongly curved. The harpes are oblong, with an oblique tip. The anterior legs of the male are usually short and stout, the femur is very strongly developed, and the tibia is short and thick, with the epiphysis attached at the middle and extending to the tip. The tarsi are also stout and rather short. The species differs from all the others in the group by its complete maculation, and in this respect it somewhat resembles the European *aceris*, with which it was compared by its describer. The longitudinal black line at the base is never very prominent and sometimes scarcely traceable. Indeed, in some of the paler specimens it is altogether absent. Eight males and fifteen females have been compared for this description from divers collections.

LARVA.

French, Sixth Rept. Ill. State Normal Univ., 1880, p. 45.—Marten, Tenth Rept. Ill. State Entomologist, 1881, p. 132.

Stage IV.—Width of head, 2 to 2.2 mm.; shining dark brown over the lobes, clypeus and mouth pale whitish. Body greenish white, with traces of a powdery blackish dorsal shade most distinct on joints 5 to 9 and 12. Hairs whitish, not very abundant, the primary form small, concolorous warts, secondary not numerous, similar to the primary. Dorsally on joints 5, 6, 7, 8, 9, and 12 a thin pencil of black hairs.

Stage VI.—Head shining black, the clypeus brownish, its suture pale; width, 4.5 mm. Body greenish white, with a dorsal blackish band, pulverulent, obscurely geminate, often entirely absent, except for a double black mark on the cervical shield and a black spot on joints 5 to 13, or 5 to 9 and 12. Thoracic feet pale brown, leg plates pale. Warts very small, the hair mostly secondary, short dorsally, and spreading each way from the center of the segment; quite long laterally. Dorsal pencils tapering, moderately long, broadest at base and arising from a single large area representing tubercles I. The pencils may be present on joints 5, 6, 7, 8, 9, 10, and 12, with a trace of one on 11 or else only on joints 5 to 9 and 12. All the hairs, both pencils and general clothing, white or pale yellow, the pencils becoming black with yellow tips, apparently at maturity, as in the case of all the hairs of *leporina*. Length, 40 mm.

Pupa.—Abdominal segments finely punctured for more than the anterior half, regularly tapering; wing cases grooved and wrinkled. Cremaster very short, consisting only of an elliptical wrinkled area from which the hooks arise, a bunch of four or five in the upper row, the central one strongest, and a line of four or five on each side below, the most anterior one strongest, none much recurved. Color rather light red brown, shining. Length, 16 mm.

Food plant.—Hackberry.

ACRONYCTA AMERICANA Harris.

(Plates I, fig. 2, adult; VI, fig. 17, larva; XIV, fig. 11, ovipositor female, 3; 6, thorax from side; XVII, fig. 10, leg; XVIII, fig. 4, palpus; XIX, fig. 11, male genitalia.)

Acronycta americana HARRIS, Rept. Ins. Mass., 1841, p. 317; Ins. Inj. Vegetation, 2d ed., 1852, p. 317; Ins. Inj. Vegetation, Flint ed., 1862, p. 436, figs. 216–218; Ent. Corr., 1869, p. 311, fig. 111.—LINTNER, Twenty-sixth Rept. N. Y. State Cab. N. H., 1872, pp. 135–157.

Apatela americana GROTE, Bull. Buff. Soc. Nat. Sci., 1874, II, p. 154.—COQUILLETT, Papilio, 1881, I, p. 6.—PACKARD, Ins. Inj. Forest Trees, 1881, p. 111.—GROTE, Papilio, 1883, III, p. 111.—PACKARD, Forest Insects, 1890, p. 397.

Megacronycta americana GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 10.

Phalaena aceris SMITH and ABBOT, Ins. Ga., 1797, II, p. 184, pl. XCIII.—GUENÉE, Spec. Gen., Noct., 1852, I, p. 48 = *acericola*.

Acronycta acericola GUENÉE, Spec. Gen., Noct., 1852, I, p. 48.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 57.

Acronycta hastulifera, larva, GUENÉE, Spec. Gen., Noct., 1852, I, p. 47.

Apatela obscura HENRY EDWARDS, Ent. Amer., 1886, II, p. 169, pr. var.

The ground color is a somewhat pale, powdery ashen gray, with a more or less obvious yellowish tinge, which is often entirely absent. Head and thorax are slightly black powdered, but even in color throughout. The primaries have the ordinary marks fairly well traceable, but not contrasting and hardly distinct. The basal line is marked on the costa only. The transverse anterior line is geminate, usually incomplete, sometimes hardly traceable. As a whole it is outwardly oblique, strongly dentated, and outcurved between the veins. The transverse posterior line is more distinct, lunulated outwardly, denticulated on the veins. The inner line is less marked than the outer, and the intervening space is usually paler, sometimes quite prominently so. There is no subterminal line and no distinct trace of any such in any specimen before me. In some specimens there is a fairly distinct shade line running obliquely from the costa to and darkening the middle of the reniform, but this does not extend below that point in any specimen that I have seen. The ordinary spots are fairly distinct in most specimens; the orbicular is round or oval, ringed with blackish, and without a central spot in the specimens before me. The reniform is large, kidney shaped, usually somewhat incomplete, and occasionally vaguely defined. It has always a central, dusky lunule, and is sometimes entirely dark. There is a distinct black dash in the submedian interspace crossing the transverse posterior line, and there is another, much less obvious, which crosses the line opposite the cell. In some cases a dusky shading accompanies the first mentioned of these spots. There is a series of dark terminal dots, beyond which the fringes are cut with smoky. The secondaries are yellowish gray or white in the male, more or less smoky and sometimes quite dark in the female. In some specimens the outer line of the underside is visible through the wing. Beneath, whitish or smoky, both wings with a discal spot and a more or less obvious outer line.

Expanse, from 2 to 2½ inches (50 to 62 mm.).

Habitat.—From Canada to Texas, west to Salt Lake City. It is taken in New York from May to July almost continuously, and again in September; Washington, District of Columbia, May 10; New Hampshire, July 12; Mount Airy, Pennsylvania, May 1 and 18; Texas, in April; Canada, June and July.

This is the largest species of the group, and can hardly be mistaken for any other. While on close examination it has almost identically the markings of the preceding, yet they are much less evident and more broken. The dagger marks crossing the transverse posterior line are usually quite evident, though that opposite the cell is not infrequently wanting. Besides being larger, the wings of this species are also more evenly trigonate than are those of the preceding. There is some variation in ground color, but not much in other directions. Mr. Edwards has described an unusually dark form from Salt Lake City as *obscura;* but similar forms occur in the East, and the difference, such as it is, is hardly worthy of a separate name. Smith and Abbot considered this to be the same as the European *aceris;* but, as Guenée pointed out, the similarity is not very strongly marked.

The clasper of the male is of moderate length and stout, quite evenly curved. The harpes are unusually broad at the center and taper to a rounded point. The anterior leg of the male is very strongly developed, the femur being actually and proportionately the largest found in the genus. It is excavated inferiorly near the tip to receive the short, stout tibia. The epiphysis is attached at a little below the middle and extends to the tip. Eighteen males and twenty-three females were compared.

LARVA.

Smith and Abbot, Lep. Ins. Ga., 1797, II, pl. xciii (*aceris*).—Harris, Ins. Inj. Veg., 1841, p. 317.—Guenée, Spec. Gen., I, 1852, p. 47 (*hastulifera*).—Harris, Ent. Corresp, 1869, p. 311.—Lintner, Ent. Cont., 1872, p. 158 (*hastulifera*).—Coquillett, Papilio, 1881, I, p. 6.—Dimmock, Psyche, 1885, IV, p. 274.—Packard, Fifth Rept. U. S. Ent. Comm., 1890, p. 397.—Comstock, Manual Stud. Ins., 1895, p. 307, fig. 373.

Egg.—Solitary, on the upper side of the leaf. Circular, flat, with almost eighty ribs on the margin, the ribs finely wavy at the summit. Grooves between even, smooth, becoming confluent reticulate toward apex and diminishing rapidly in number. Micropyle coarsely irregularly reticulate. Green, the upper part dotted with brown so thickly as to leave only rings of little green spots. Diameter, 1.2 mm ; height, 0.25 mm.

Stage I.—Head round, bilobed, mouth produced, tips of jaws brown; width, 0.4 mm. Body colorless, green from food; setae single from low concolorous tubercles, I on joints 5 to 14 black, the rest whitish, long and slender, spinulated. Head setae above, and one of cervical shield also black. Tubercles whitish. Skin shining, faintly annulate, without marks.

Stage II.—Head bilobed, white; width, 0.6 mm. Body green from food, no marks; hairs fine, long, and white, a few black ones dorsally rising in bunches from small concolorous warts, normal. Joint 12 a little enlarged.

Stage III.—Head white, a large black patch over the lower half of each lobe, irregular above, and a small patch over clypeus; width, 1 mm. Body green from food; no marks. Hair long, abundant, from low, small warts, white, a few black ones dorsally, especially in straggling tufts on joints 5, 7, and 12. Possibly a few secondary hairs, but not distinct. Later traces of a geminate dorsal and single subdorsal black line.

Stage IV.—Head bilobed, all black, labrum and setae white; width, 1.65 mm. Body greenish white, a double dorsal and a lateral black line more distinct than before. Hair long, dense, all white, except a long black pencil from wart I on joint 5, 7, and 12 arising from a black patch, those on joints 5 and 7 double and divaricate. Warts white, obscure subventrally. Much short secondary hair is present. Thoracic feet, abdominal leg plates, and joint 14 black. Later the hair is yellowish, except at the tips.

Stage V.—Head black; width, 2.5 mm. Body greenish white, with double dorsal, single lateral, and stigmatal black lines, and black shading subventrally and ventrally. Legs black and the whole of joint 13 dorsally, as well as dorsal spots on joints 5, 7, and 12. Hair yellowish white. Pencils long, black, double on joints 5 and 7; single on joint 12 as in the mature larva.

Stage VI.—Head shining black, the sutures pale; width, 4.6 mm. Body greenish white, above marked with a geminate dorsal, a single lateral, and stigmatal black lines, all broken. Subventral region, feet and venter, with joint 13 above, also sooty black, the legs and plates shining. Hair abundant, about 2 mm. long, not concealing the body, and all of about uniform length, except a few long ones on joint 3, white. Black pencils dorsally on joints 5, 7, and 12, as in the next stage. Length, 45 mm.

Stage VII.—Head large, rounded, scarcely bilobed, shining black; the clypeus is high, reaching three-fourths the height of the head; the sutures on the sides and the one dividing the two lateral clypeal segments pale yellowish; labrum pale; width, 6 mm. Body pale greenish white, a series of geminate dorsal dots in the incisures of joints 5 to 12, a broad stripe on joints 12 to 13, narrowing in front, a broken obscure stigmatal line and traces of a lateral line posteriorly, as well as the thoracic feet, abdominal leg plates, and a broad ventral shade on joints 11 to 13, black. Warts small and obscured by the abundant secondary hairs, which are longer laterally than on the dorsum, diffusely spreading, pointing in all directions, rather short, not concealing the body, white or pale yellow. On joints 5, 7, and 12 wart I bears a long, slender pencil, forming a well-separated paired tuft on joints 5 and 7, consolidated into a single pencil on joint 12. Spiracles white, with black border. Length, 70 mm.

Cocoon.—Double, a thin outer web of silk and larval hairs and a thick inner cocoon of silk and chips of wood thickly interwoven. The cocoon is formed on a piece of wood, and consists half of the cocoon and half of the cavity in the wood formed by the removal of the chips to construct the cocoon. Length, 40 mm.; width, 20 mm.

Pupa.—Shining brown. Wing cases longitudinally grooved and shagreened. Abdomen regularly tapering, the segments smooth and punctured on the anterior portion. Cremaster rounded, blunt, coarsely wrinkled, the upper hooks a dense cluster of three or four, the lower a line of three to five on each side.

Food plants.—Maple, elm, chestnut, linden, poplar, birch, alder, oak, hickory, ash, sycamore.

ACRONYCTA HASTULIFERA Smith and Abbot.

(Plates II, fig. 12, female; III, fig. 5, male adult; VI, figs. 12, 13, larva; XVII, fig. 11, leg; XIX, fig. 14, male genitalia.)

Phalaena hastulifera SMITH and ABBOT, Ins. Ga., 1797, II, p. 183, pl. XCII.
Acronycta hastulifera GUENÉE, Spec. Gen., Noct., 1852, I, p. 47.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 56.
Acronycta acericola larva ‡ GUENÉE, Spec. Gen., Noct., 1852, I, p. 48.

Ground color a pale gray, almost whitish in the male, with a bluish tinge in the female. The head and thorax slightly powdery, without distinct marking. The primaries have the ordinary maculation mostly traceable, but more or less broken. The basal line is entirely wanting, or is marked on the costa only. The transverse anterior line is never entirely complete, and rarely even traceable across the entire wing. It is geminate, the inner line more distinct, and often this is prominent only just below the cell, where it forms a little inward tooth from which the line is feebly traceable to a costal spot on the one hand and to a more vague blotch on the inner margin near its middle. The transverse posterior line is single, consisting of a series of connected lunules which are black and quite obvious, somewhat emphasized by a preceding paler shade. The line is only a little toothed on the veins, and as a whole makes an even outcurve, followed by one as evenly inward in the submedian interspace. There is a vague median shade, often traceable across the entire wing, but obvious only as an oblique mark from the costa to the reniform. Beyond the transverse posterior line is a dusky shade, which gradually merges into the ground color before the outer margin. There is a series of terminal black spots, beyond which the fringes are marked but not entirely cut by dusky. There is a distinct dash crossing the transverse posterior line opposite the anal angle, but there is no line opposite the cell. The orbicular varies in size and shape; sometimes small, sometimes large, and it may be entirely rounded or distinctly oval. It is always ringed with blackish and is not dark centered. The reniform is kidney shaped, large, more or less incomplete, and with a central dusky lunate mark. The secondaries are whitish, with a faint yellowish tinge in the male, smoky brown in the female. In both sexes there is a series of terminal lunules, which are sometimes almost connected. Beneath, the wings are whitish or smoky, powdery, and in the male with a more or less obvious discal spot; in the female also with a more or less obvious outer line.

Expanse, 1.70 to 2 inches (42 to 50 mm.).

Habitat.—New York; Philadelphia, Pennsylvania; New Jersey; Washington, District of Columbia, May 29; Massachusetts; California; Canada in June; Georgia; Central States.

I have 7 males and 6 females representing this species, which has been generally confused in collections, sometimes with *dactylina* and sometimes with *americana.* It resembles both and differs from both, and its most obvious character is the difference between the sexes. The males are smaller and much paler throughout, not only in the secondaries, but in the primaries as well. The secondaries are much more robust, and the fore wings are distinctly broader and less trigonate than they are in the male. This species was properly figured in both stages by Smith and Abbot, and can be readily separated from *americana*, on the one hand, by its paler ground color, smaller size, and single transverse posterior line, and from *dactylina* by the yellowish shading, which is totally absent in the latter species.

LARVA.

SMITH and ABBOT, Lep. Ins. Ga., 1797, II, pl. XCII (*hastulifera*).—GUENÉE, Spec. Gen., Noct., 1852, I, p. 48 (*accricola*).

Stage III.—Head bilobed, black, a few hairs; width, 1.8 mm. Body black, warts concolorous; hair thick, but short, obscuring the body, tawny brown, tipped with black and white, scant subventrally. On joints 5, 7, and 12 a black dorsal tuft, higher than the rest of the hair, and in the subdorsal space on joints 5 to 13 the hair is white.

Stage IV.—Head bilobed, smooth, black, and shining; a few white hairs; labrum whitish; width, 2.4 mm. Body black, spiracles white, warts III, IV, and V orange. Hairs as before, the brown strongly tipped with white.

Stage V (interpolated).—Head as before, slightly creased; width, 3.2 mm. Body black, all as before, but the dorsal tufts are scarcely longer than the other hairs, while all are tipped with white.

Stage VI.—Head black and shining, labrum pale; a V-shaped pale line parallel to the sutures of clypeus; width, 4.6 to 4.8 mm. Body black, spiracles white. Hair dense, of even length, not long, the secondary hairs not abundant. Warts distinct though small, few-haired, III and IV reddish. Hair dark brown except in a broad dorsal band on joints 5 to 13, which is black, containing the concolorous tufts on joints 5, 7, and 12, which exceed the other hairs very slightly. Both the black and the brown hairs are sparsely barbuled and end in very slightly enlarged colorless tips, which give the larva a hoary appearance quite characteristic. The hairs form bands across the segments as in *dactylina*, but the bare incisions are much narrower than in that species. A few longer hairs from the extremities; dorsal hair not keeled. Length, about 35 mm.

Cocoon.—Elliptical, rather narrow, tough, and firm; composed of silk and some larval hairs intermixed; no wood, chips, or earth. Length, 30 mm.

Pupa.—Shaped as in *leporina*, the abdominal segments punctured on the anterior half; quite regularly tapering. Cremaster a low, wide elevation, with a cluster of four hooks on either side above and a single remote one below and farther in front. Color, dark blackish brown, slightly shining. Length, 18 mm.

Food plants.—Alder.

ACRONYCTA HESPERIDA, new species.

(Plates X, fig. 9, female adult; XIX, fig. 15, male genitalia.)

Ground color bluish ash gray, with very fine black and coarser smoky powderings. The ordinary markings are distinct in the male, but somewhat washed and indefinite in the female. The basal line is marked on the costa only, and then but feebly. The transverse anterior line is outwardly oblique, geminate, outcurved between the veins, and reaches the inner margin at about its middle. In the male the two lines are equally distinct, and are smoky, the intervening spaces of the ground color. In the female the line is broken, and sometimes disappears almost entirely, the outer portion being often represented by a dot in the middle of the wing, and a dusky blotch on the costa and inner margin. The transverse posterior line is black or blackish, lunulate, well removed outwardly, strongly incurved below the cell, and thus bisinuate. The black lunules are preceded by a whitish shade and also, opposite the cell and in the submedian interspace, by a smoky mark. The line is followed by a dusky shade, which merges insensibly into the ground color. Subterminal line wanting. There is a series of black or smoky terminal spots in the interspaces, which may or may not cross the fringes. In the female all this marking is obscured; but on the other hand there is a vague, smoky, almost upright median shade, which darkens the reniform and forms a smoky blotch on the inner margin. The ordinary spots are distinctly outlined in black in the male, but vague and partly obscured in the female. The orbicular is round and usually small, sometimes minute; the reniform is large, kidney shaped, and has a smoky central mark which, in the female, obscures the entire spot. There is no basal streak, and only a poor indication in some specimens of a dagger mark opposite the anal angle, an outward tooth of the transverse posterior line, which is here usually best marked, giving the appearance of a small dash. The secondaries are whitish, a little soiled in the male, strongly gray powdered in the female, in which there is a more or less obvious, diffuse, outer smoky band. The veins are smoky, and there is a traceable discal lunule. On the under side the wings are whitish in the male, smoky in the female; in both sexes with a discal lunule and in the female also with a diffuse outer shade line. The head and thorax are without marks of any kind, save there is a blackish mark between the eyes and the base of the wings in some specimens. The sides of the palpi are also black.

Expanse, 2 to 2.25 inches (50 to 56 mm.).

Habitat.—"California;" Seattle, Washington; Tacoma, Washington, August 7; Nanaimo, Vancouver.

Two males and six females are before me, nearly all of them in fair condition. The Californian specimens are probably from the Sierra Nevada Mountains, but I have no definite data concerning them. Types are in the U. S. National Museum, the American Museum of Natural History, and in the collections of Messrs. Graef, Dyar, and Doll. This species is intermediate in most respects between *hastulifera* on the one hand and *dactylina* on the other. It has most the appearance of *dactylina* and has been mistaken for that species. It is probably not at all rare, and replaces *dactylina* in the Northwest. Where a series of specimens can be compared there is no difficulty at all in recognizing the distinctness of this species. It is larger, in the first place; it is also much darker bluish gray. In the male the secondaries are somewhat soiled instead of nearly white, as in the Eastern species. The markings in the female are much more obscure, and the dagger mark opposite the anal angle is entirely absent, although its position is indicated by the angle in the line which has been referred to in the description. The sexual characters of the male do not differ from the ordinary form in this series.

ACRONYCTA DACTYLINA Grote.

(Plates I, fig. 3, adult; VII, figs. 18, 19, larva; XVII, fig. 11, leg; XIX, fig. 13, male, genitalia; XVI, fig. 8, venation.)

Apatela dactylina GROTE, Proc. Bost. Soc. N. H., 1874, XVI, p. 239.—MORRISON, Psyche, 1875, I, p. 42.—GROTE, Papilio, 1883, III, p. 111.

Megacronycta dactylina GROTE, Mitth. a. d. Roem. Mus., Hildesh, No. 3, 1896, p. 10.

The ground color is bluish gray with rather dense, fine powderings. Head and thorax without distinct markings, but powdered like the rest of the upper surface. Primaries with the ordinary maculation broken, basal line rarely marked even on the costa; transverse anterior line variably evident, geminate near base, evenly oblique outwardly, and moderately outcurved between the veins. In many cases a mark below the cell is all that is present. The transverse posterior line is single, black, lunulate, more or less dentate on the veins, preceded by a paler and followed by a darker shading. There is a series of terminal spots at the base of the fringes, from which a line sometimes cuts through to the outer edge. The median shade is marked only by a more or less indefinite, dusky, oblique shade on the costa, which extends to and darkens the center of the reniform. The orbicular is small, round, or oval, dark ringed, and centered with the ground color. The reniform is kidney shaped and more or less dusky centered. The secondaries are white in the male, gray, with a slight smoky tinge, in the female. Beneath white or gray, more or less powdery, all wings with a discal spot, and in the female with a more or less obvious outer line.

Expanse, 1.70 to 2 inches (42 to 50 mm.).

Habitat.—Massachusetts, in June; New York, in June and July; Minnesota, July 20; New Jersey, June 23; New Hampshire, July 20; Maine; District of Columbia, in May; Canada, in July; Colorado.

This species is quite widely distributed north of the Potomac and west to the Rocky Mountains, but does not extend very far north of the Canadian line, so far as the specimens before me indicate. The species differs by its bluish-gray color from all those that have preceded it, and the white secondaries are also distinctive. Occasionally a dark female may cause doubt as to whether it is not referable to *hastulifera;* but in this case the locality comes to our aid to some extent, because the present species does not extend south so far as does the other, while *hastulifera* does not extend north as far as *dactylina.* The front in this species and in *hastulifera* is evenly convex, but not at all bulging and not in the least conic. The sexual pieces are also strongly alike in both. They are oblong, the tip diagonal, while the clasper is of moderate length and only a little curved. Twenty males and sixteen females have been compared.

LARVA.

DIMMOCK, Psyche, IV, p. 274.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 498 (sp. 42, birch ins.); Ibid., p. 626 (*hastulifera*).—EDWARDS and ELLIOT, Bull. Am. Mus. Nat. Hist., 1892, IV, p. 77.

Stage I.—Colorless, whitish, the food showing green. Hairs from warts, long, silky white, mixed with a few black ones from warts I on joints 3, 5, 7, and 12. Head bilobed, whitish, eyes black, mouth brown; width, 0.7 mm.

Stage II.—Head shining black with two concave white bands close to the clypeus and connected above it by a cross-bar; a white mark above ocelli, another behind; clypeus greenish centrally, mouth parts pale; width, 1.2 mm. Hair long, curved, soft, white, with long, distinct, single black pencils from tubercle I on joints 5, 7, and 12. Warts concolorous, body whitish, a slight irregular black marking subdorsally.

Stage III.—Head entirely black; width, 1.8 mm. Body as in the mature larva, but only partly black, being spotted and streaked with yellow, especially substigmatally. Primary hairs from distinct pale warts, IV behind the spiracle, V and VI small; hairs long, barbuled. Secondary hairs shorter, most numerous dorsally. Primary hairs all white except the black pencils; secondary hair yellowish, shading to fleshy brown on the back.

Stage IV.—As before, the body blacker, very black in the incisures. Secondary hair abundant, the black pencils long. Primary hairs stiff and pale, radiating from the warts. Width of head, 2.4 mm. The appearance of segmentary bands of hair is heightened by the pale color of the center of the segments contrasting with the black incisures. Thoracic feet and venter black.

Stage V.—Like the mature larva; width of head, 3.6 mm. Lateral hair all fleshy brown except stigmatally and subventrally, where it is yellowish. Body all black except on the folds where the hair is very thick and there it is pale yellow. No continuous yellow substigmatal band. A narrow, faint, yellowish dorsal line of hairs.

Stage VI.—Head black, the lobes separated by a vertical notch; width, 4.5 mm. to 5 mm., line above labrum white. Body black, densely covered with secondary hairs, except rather broadly in the incisures, forming bands of short hair, obscuring the body except laterally where it is much thinner; slightly keeled along the dorsal line. Hair light yellowish on the sides, shading into fleshy brown on the back. On joints 5, 7, and 12 a single erect black pencil, twice as long as the other hair, yet relatively shorter than in the previous stage. A few long white hairs from the extremities. A faint yellowish irregular substigmatal band, excavated for the spiracles and concolorous with the lateral hairs; spiracles white.

Cocoon.—Single, elliptical, not very thick but tough, composed of coarse silk with larval hair scattered over the outside, spun among leaves, etc.

Pupa.—Abdomen tapering, the segments sparsely punctured on the anterior side; wing cases creased and shagreened. Cremaster short and blunt, coarsely shagreened and wrinkled, the upper hooks in a dense cluster of about eight on each side, the lower ones absent or represented by one or two slight hooks.

Food plants.—Alder, willow, birch.

ACRONYCTA FELINA Grote.

(Plates XI, fig. 9, female adult; XIX, fig. 22, male genitalia.)

Apatela felina Grote, Bull. U. S. Geol. Surv., 1880, IV, p. 208.

Ground color a very dark blue gray, densely black powdered. Head and thorax as usual immaculate. Primaries with all the lines absent, or only vaguely indicated. The veins are somewhat darker than the rest of the wing, which thus gives a somewhat strigate appearance. There is a distinct black basal line, which extends well toward the middle of the wing, and in some cases nearly meets another which reaches the outer margin and represents the dash that in better-marked species crosses the transverse posterior line. In some specimens the transverse anterior line is marked on the costa, and occasionally the transverse posterior line is indicated by a pale shade. The ordinary spots are wanting; but in some instances the reniform is vaguely indicated. The fringes are cut by somewhat indistinct dark lines opposite the interspaces; but there are no distinct terminal dots; occasionally a black dash is traceable opposite the cell, about where the transverse posterior line should cross. Secondaries white, in the female more or less black powdered. Beneath powdery white, with a more or less obvious discal dot and outer shade line.

Expanse, 1.60 to 1.80 inches (40 to 45 mm.).

Habitat.—Seattle, Washington; Sierra Nevada, California; Colorado (Bruce), Glenwood Springs in October (Barnes).

Twelve specimens, evenly divided as to sex, are before me, and offer very little in the way of variation. The species is quite characteristic and its very dark gray color with the almost entire absence of the ordinary marks will be sufficient to distinguish it. The head is rather smaller than usual, and more retracted. The front is hardly bulging and the tongue is a little weakened. The anterior legs of the male do not differ essentially from those of the immediately preceding species. The harpes of the male are more elongate than usual, quite even in width, and obtusely rounded at the tip. The clasper is rather short, strongly curved, and moderately stout.

ACRONYCTA FRIGIDA, new species.

(Plates XI, figs. 6, 10, male and female adults; XX, fig. 4, male genitalia.)

Acronycta lepusculina ‡ Henry Edwards, Proc. Cal. Ac. Sci., 1875, VII, p. 23.
Apatela felina ‡ French, Can. Ent., 1889, XXI, p. 36.

Ground color dark blue gray, quite densely powdered with black. On the primaries the veins are marked with smoky, giving the wings a strigate appearance. Markings variable, but as a rule the ordinary spots and the transverse posterior line are fairly well marked, the reniform being distinct in all the specimens before me. The basal line is marked by a black dot on costa, or it may be entirely absent. The transverse anterior line may be absent, or may be marked by a blotch on the costa and an angulated mark in the submedian interspace. The median shade is marked by a spot on the costa and another on the internal margin, though both of these may be absent. The transverse posterior line is feebly lunulate, rather evenly bisinuate, and preceded by a slightly paler shade. In one specimen it is hardly traceable. The fringes are cut by smoky marks in the interspaces. The ordinary spots are obscure; the orbicular oblong, feebly black ringed, the reniform an indefinite black lunule. There is a distinct black basal streak which almost joins the dagger opposite the anal angle. The dagger mark opposite the cell is also very distinct. The secondaries are quite evenly smoky white, with the discal spot of the under side showing through. Beneath, the wings are whitish, powdery, the disk of the primaries smoky. On the primaries is a discal spot from which a spur is sent out, reproducing in a diffuse way the dagger mark of the upper side. The secondaries have a distinct outer transverse line, and a discal spot which, in one specimen, sends a dusky line to the base. The head and thorax are without markings save that there is a distinct line from the eyes to the base of the wings, and the sides of the palpi are blackish.

Expanse, 1.70 inches (43 mm.).

Habitat.—Sierra Nevada; Truckee, California.

Four specimens, one male and three females, are before me. Two are from the collection of the United States National Museum, one from the Rutgers College collection, and one from the collection of Prof. George H. French. The male is labeled July, Alameda County, California. One female is marked April, Alameda County, California, larva on willow. The specimen from the college collection is labeled Sierra Nevada, while the specimen from Professor French is marked from Truckee, and is dated May 6. This specimen was bred by Professor French and was mistaken by him for *felina*, which indeed it closely resembles at first sight. The specimen appears to have been mounted when fresh, and though not crippled looks somewhat undeveloped as compared with the others before me. The male is slightly smaller than the females and seems to be also a little paler in color, while the markings are a little more distinct. As compared with *felina* the wings are shorter and proportionately broader. The markings are much better defined than in any specimens of *felina* that I have seen, and with a series of the insects at hand there is no difficulty whatever in recognizing their distinctness. The sexual structures are very similar in the two species, the harpes in *frigida* being proportionately a little broader, while the clasper seems to be rather longer and more slender; but the differences are slight and would hardly be considered of specific importance were it not for the other characters.

This is also the species referred to by Mr. Henry Edwards as the Pacific coast form, which he believed to be the true *lepusculina* Guenée.

LARVA.

EDWARDS, Proc. Cal. Acad. Science, 1875, VII, p. 23 (*lepusculina*).—FRENCH, Can. Ent., 1884, XIX, p. 49 (*felina*).—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 566 (*felina*).

Stage I.—"Dull whitish, upper part and sides of joints 2, 4, 5, 7, 8, 9, 12, and 13 reddish purple; brown hairs in clusters from the tubercles, the dorsal ones larger than the body; head black, feet purplish." (French.)

Stage II.—"White, the dark dorsal joints black; tubercles and head black; hair from the dorsal tubercles gray, the rest whitish." (French.)

Stage III.—"Creamy white, joints 2–5, 7–10, 12, and anal plate black above; a fine, white dorsal line. Tubercles bearing hairs of various lengths, the two dorsal ones on joints 5, 7, and 12 with small pencils of short black hairs and a few black hairs on the other dark joints. Head and feet black." (French.)

Stage IV.—"A dorsal gray stripe with central white dorsal line; a subdorsal gray stripe; sides greenish pale yellow. Hairs in thick clusters, spreading, with black tufts on joints 5, 7, 8, and 12 and forming a long fringe on each side of the body and behind." (French.)

Stage V (interpolated).—Head shining brown-black or pale, mottled with black spots; width, 4 mm. Body greenish white without marks, warts very small, primary and secondary hairs alike, long, fine, radiating in all directions, but straight, not curved; small black dorsal pencils on joints 5, 7, and 12 shorter than the other hair.

Stage VI.—Head pale, reddish mottled; width, 4.5 mm. Body without marks, the numerous long, soft, fine hairs radiating in all directions, yellow, not obscuring the body. No black hairs. Thoracic feet black.

Cocoon.—"Of silk and wood fiber; thin, firm, and tough." (French.)

Pupa.—Abdominal segments regularly tapering, slightly punctured in front; cases shagreened; mahogany brown. Cremaster short and wide, coarsely wrinkled above, upper hooks single, lower six to eight on each side, some projecting laterally, others backward, recurved.

Food plants.—Willow and poplar.

ACRONYCTA PACIFICA, new species.

(Plates XI, fig. 5, male adult; XX, fig. 2, male genitalia.)

Ground color a powdery ashen gray, in which all the markings are more or less obscure. The transverse anterior line is feebly traceable, geminate, twice outcurved, so that the inward angulation in the submedian interspace connects with the black basal streak. The median shade line is marked on the costa by a smoky blotch. The transverse posterior line is even, smoky, bisinuate; best marked in the submedian interspace, where it is crossed by a slender black dagger mark; subterminal line wanting. The fringes are cut by smoky lines opposite the interspaces. The orbicular is very small, oval, marked by black scales, and may be scarcely traceable. The reniform is also indefinite and consists of a shapeless smoky mark. Beyond the transverse posterior line the wing is somewhat more densely powdered and seems darker. The secondaries are white in the male and only a little smoky in the female. On the underside the wings are white, with discal marks and an outer line on each.

Expanse, 1.50 to 1.75 inches (37 to 45 mm.).

Habitat.—California.

Three males and one female are before me. All of the specimens are directly or indirectly from the Henry Edwards collection. Two of them are from the American Museum of Natural History, numbered 9615. One is labeled Sierra Nevada, while the solitary female, from the collection U. S. National Museum, is simply labeled California. In genital structure the species much more nearly resembles the *populi* series than *frigida*, although in markings it approaches most closely to some pale specimens of the latter. The harpes are very broad, and widen toward the tip, while the clasper is very long, slender, and pointed.

ACRONYCTA INSITA Walker.

(Plates IV, fig. 3, male adult; X, fig. 8, male adult; XVII, fig. 13, leg; XIX, fig. 16, male genitalia.)

Acronycta insita WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 61.—GROTE, Papilio, 1883, III, p. 111.

Ground color white, strongly black powdered, giving the creature a somewhat bluish ash-gray appearance. Head and thorax without distinct markings. Primaries with the ordinary lines more or less indefinite, but all of them marked on the costa. There is a distinct black basal streak, which usually extends to the point at which the transverse anterior line is ordinarily found; but sometimes it is abbreviated and in one specimen very slightly marked. The basal line is indicated by a black dot on the costa. The transverse anterior line is indicated by a black spot on the costa, by a more or less indistinct angular mark below the cell, and sometimes by a blackish mark on the inner margin. Sometimes the costal spot only is present. A distinct black spot near the middle of the costa indicates the median shade. The transverse posterior line is single. When well marked it is lunulate, but it tends to become disconnected, and occasionally it is marked only by a difference in shading, the terminal portion of the wing being somewhat darker. It is better marked, as a rule, opposite the cell, and there may be one or two rather distinct black marks indicating the position of a dagger. The lunule in the submedian interspace is always evident, crossed by a dark mark, and usually more or less shaded with blackish. There is a series of black terminal dots, beyond which the fringes are cut with black. The orbicular is wanting in most specimens, but is sometimes faintly outlined. The reniform is indefinite and forms a vague black lunule. The secondaries are white, a little soiled in the female, and in both sexes with a series of blackish terminal lunules. Beneath it is white, with a more or less obvious discal spot, and, in the female, with outer shade lines on both wings.

Expanse, 1.50 to 2 inches (38 to 50 mm.).

Habitat.—Ithaca, New York, June 5; Chicago and Urbana, Illinois; Volga, South Dakota.

This species has never before been satisfactorily identified. Mr. Grote has several times named specimens *insita;* but in almost every instance they have been male *hastulifera* or specimens of *dactylina.* The species is very easily distinguished from either by the fact that the basal streak is present, and it is therefore really much nearer to *populi* and *lepusculina.* The species is a very simply marked one, and Walker's description is quite characteristic and applies perfectly. Mr. Grote has mentioned the fact that he has examined the type and that it seemed a good species, and this is borne out by the identification just made. I have two other specimens which may belong to this species, but differ very decidedly in ground color by being very much darker and having the secondaries more powdery. The maculation is the same, however, and as both my specimens are females, I do not feel justified in giving the form a name. One of the specimens is from "Murray Bay, Province of Quebec, July or August, E. Corning, jr." The other is from Calgary, Canada, June 25. In case further material proves this form a distinct one, I would propose the term *canadensis*, which may be applied for the present as a varietal term. The foreleg of the male is rather evenly developed; the femur is not unusually thickened, and seems rather long in proportion to its width. The tibia is stout, more than half the length of the femur, the epiphysis reaching to the tip and inserted at about the middle. The harpes of the male are broad and rather short, narrowing from each edge to the pointed tip. The clasper is rather stout and long, and is more strongly curved than usual. Four males and seven females are before me, including the two mentioned as varieties.

ACRONYCTA CRETATA, new species.

(Plates XI, figs. 3, 4, male and female, adult; XVII, fig. 15, leg; XIX, fig. 18, male genitalia.)

Ground color chalky white, with a sparse powdering of black scales, which are chiefly massed along the costa, the internal margin, and behind the transverse posterior line. The basal line is indicated by a small black dot on the costa. The transverse anterior line is marked by a black spot on the costa, a triangular mark in the submedian interspace, and an irregular blotch on the internal margin near its middle. The median shade is marked by a black spot on the costa above the reniform, and it may send a vague shade to that spot. The inception of the transverse posterior line is also marked by a black spot on the costa, the line bending outwardly very strongly and then bisinuate, more or less broken, to the inner margin. The line is emphasized opposite the cell by two more or less obvious black marks which indicate a dagger, and in the submedian interspace it is very prominent and crossed by a distinct dash, forming a typical *psi*. The subterminal line is wanting. There is a series of distinct black terminal dots, which extend to the middle of the fringe in the interspaces. The ordinary spots are not well marked. The orbicular may be absent; it may be a small black dot or a small circlet. The reniform is blackish or black and irregularly lunate. There is a short black basal streak which does not reach to the transverse anterior line. Secondaries white, the veins a little smoky, and in the female a more or less obvious discal spot. Beneath pure white, both wings with a discal lunule, and in the female with a more or less well-marked outer line; a series of terminal spots on both wings. The head and thorax are without markings, save for the very prominent black line which extends from the sides of the palpi across the eye and to the base of the wings.

Expanse, male, 1.45 inches (36 mm.); female, 1.80 to 2 inches (45 to 50 mm.).

Habitat.—Garfield County, Colorado; 7,000 feet.

Three specimens collected by Mr. Bruce are types in the collections of U. S. National Museum and Rutgers College. The male is numbered 833, the females 827, 828. Whether the difference in size between the sexes is always so strongly marked as in the specimens before me I can not say, but I am inclined to doubt it. The male specimen here is probably undersized, and the markings are much less definite than they are in the female. This species is easily distinguished from its nearest ally, *leporina*, by its chalky white ground color and its more powdery markings. The genital structures are also quite obviously distinct. In *cretata* the harpes are much narrower and the tip is irregularly rounded, while the clasper is much shorter and stouter than in its eastern ally. The structure of the front legs in the male is also different, the femur being much the stoutest in *cretata*, while the tarsi are relatively longer.

ACRONYCTA LEPORINA Linnaeus.

(Plates VIII, fig. 26, larva; XI, figs. 1, 2, male and female adults; XVII, fig. 14, leg; XIX, figs. 17, 19, male genitalia.)

Phalaena noctua leporina LINNAEUS Syst. Nat., 1766, I, 2, p. 109.

Acronicta leporina HÜBNER, Verzeichniss, 1818, p. 201.—TREITSCHKE, Schmett. Eur., 1825, V, 1, p. 51.

Apatela vulpina GROTE, Can. Ent., 1883, XV, p. 8; Papilio, 1883, III, p. 68; Can. Ent., 1888, XIX, p. 20.—PACKARD, Forest Insects, 1890, p. 461.—GROTE, Mitth. a. d. Roem. Mus., Hildesh, No. 3, 1896, p. 91.

Apatela sancta HENRY EDWARDS, Ento. Amer., 1888, III, p. 185.

Ground color creamy white, the black powdering sparse and not prominent. Head and thorax without markings; the primaries with the ordinary lines more or less incomplete. The basal line is usually marked by a dot on the costa; but that is not always present. The transverse anterior line is marked by a distinct black costal spot and by a small angulated mark below the cell. Occasionally there is a dusky shade on the inner margin. The median shade is marked by a black spot at about the middle of the costa. The transverse posterior line is usually broken, but occasionally it is almost continuous, sinuate, and as a whole follows the outer margin. When the line is broken it consists of a series of somewhat lunate spots opposite the cell, and a lunate mark in the submedian interspace, which is crossed by a more or less obvious black dash, though this may be entirely wanting. There is a series of black terminal spots beyond which the fringes are distinctly cut with black. The orbicular may be wanting, or may be indicated by a black dot or by a small circlet. The reniform is marked by a more or less distinct but indefinite black lunule. There is a short black basal streak, which does not reach the angular spot indicating the transverse anterior line. The secondaries white in both sexes, sometimes with quite an obvious series of terminal lunules. Beneath white, with a variably evident discal spot and outer line—always more distinct in the female.

Expanse, 1.50 to 1.80 inches (38 to 45 mm.).

Habitat.—Ontario, Canada; Maine; Jefferson, New Hampshire; Massachusetts; New York; Northern Illinois.

Three male and four female specimens have been compared with a greater number of both sexes from Europe, and I am unable to discover any difference between them. As a whole, our specimens are perhaps a trifle more powdery than the usual run of those from Europe; but even this is not constant, and I have European specimens that are more powdery than some American examples. The only variations that occur, so far as I have seen, are in the distinctness of the transverse posterior line and in the relative size of the black spots. Occasionally specimens occur in which the black markings are very much reduced, so that the wing at first sight seems rather irregularly black spotted. The head is moderate in size, the front bulging, but not prominent; the tongue normal. The anterior leg of the male is stout, the femur somewhat widened in the male, and a little excavated inferiorly at the tip. The tibia is stout and rather short, with the epiphysis as usual inserted at about the middle. The harpes of the male are elongated and rather narrowed at the tip; the clasper is moderate in length, rather slight, and not greatly curved.

LARVA.

Thaxter, Papilio, 1883, III, p. 14 (*vulpina*).—Dimmock, Psyche, 1885, IV, p. 274.—Elliot and Soule, Can. Ent., 1886, XVIII, p. 124 (no name).—Packard, Fifth Rept. U. S. Ent. Comm., 1890, p. 461 (*vulpina*).

Stage I.—Head scarcely bilobed, nearly white; width, 0.65 mm. Body white, rather opaque, the dorsum of joints 2, 4–5, 7–9, and 12 broadly pale purplish brown; hairs black and white mixed. Warts with a radiating crown and central hair, IV small with two setae, VI present, elongate; several setae on the leg plate.

Stage II.—Head white; width, 1 mm. Body as before or all white; the warts large, the hair long and abundant, with a few stiff black ones the whole length, but more particularly on joints 5, 7, and 12. A few secondary hairs.

Stage III.—Head creamy white, bilobed, with or without a vertical line of spottings on the face of each lobe; width, 1.6 mm. Body whitish, scarcely touched with any brown marks, even in the most heavily spotted examples of the previous stage. Warts large, concolorous, the hairs long and soft, white, curving, some of them secondary. A black pencil dorsally on joints 5, 7, and 12, or 5, 7, 8, and 12, or on 5, 7, 8, 9, and 12. The larva sits in J-shape. The body is visible through the hairs.

Stage IV.—Head white or with a black mottled streak up each lobe, full, rounded, scarcely bilobed; width, 2.6 mm. Body white, faintly tinged with green.[1] Hairs very long, both primary and secondary, fine, curving a little, abundant, but not concealing the body, white, a few short black ones dorsally on joints 5, 7, and 12 or on the other joints as before. Warts rather large, but low and inconspicuous, normal. Another larva had a black pencil 5, 7, 8, and 12, with a black dot on joint 9 to represent a fifth pencil.

Stage V (interpolated).—In one instance this stage was observed; in most larvae it was omitted. Structure and coloration as before.

Stage VI.—Head greenish white, immaculate, or with a little blackish marking in the middle of each lobe; width, 4 mm. Body greenish white, immaculate, or with black dorsal spots to represent the hair pencils. Pencils now absent, the hair abundant, very long, curving over all around, brushed forward on the right side, backward on the left. Warts small, white; secondary hair abundant, rather finer than the primary. Hair white or yellow, a few short, bristly, black ones on the ends of the body. Before descending from the tree to pupate the head turns dull brown and finally black, except at the tip; the body becomes dull brown, tinged with green, and the hair olivaceous blackish, shading to yellow at the tips.

Cocoon.—Very slight, consisting of a few threads only.

Pupa.—Regularly tapering, the anterior sides of the segments punctured; shining, mahogany brown, cremaster blunt, wrinkly, slightly bilobed, contracted at base, and with a series of recurved hooks, the upper row a single hook or absent, the lower of four or five on each side; length, 19 mm.; width, 6 mm.

Food plants.—Poplar, willow, birch.

ACRONYCTA POPULI Riley.

(Plates VII, fig. 25, larva; XI, fig. 7, female adult; XVII, fig. 16, leg; XIX, fig. 20, male genitalia.)

Acronycta populi Riley, Second Rept. Ins. Mo., 1870, p. 119, figs. 87, 88.—Grote, Trans. Am. Ent. Soc., 1872, IV, p. 28 = *lepusculina.*—Riley, Index and Supplt. to Mo. Repts., 1881, p. 74, ? *lepusculina.*

Apatela populi Packard, Ins. Inj. Forest Trees, 1881, p. 116, fig. 55.—Grote, Papilio, 1881, I, p. 127 = *lepusculina.*—Henry Edwards, Ent. Amer., 1888, III, p. 185, sp. dist.; Bull. U. S. Nat. Mus., No. 35, 1889, p. 81, an sp. dist. *lepusculina.*

Megacronycta populi Grote, Mitth. a. d. Roem. Mus., Hildesh, No. 3, 1896, p. 6.

Ground color white, with very fine black powderings that are quite evenly distributed. Head and thorax without definite markings, save that sometimes there is a blackish shade across the collar, and the sides of the palpi are, as usual, black. The primaries with all the markings broken. The basal line is marked by a black costal spot, usually by an angulated mark below the median cell, and sometimes by a black spot at just about the middle of the inner margin. The median shade is marked by quite a prominent black spot on the costa, but rarely extends beyond that point and never extends beyond the reniform. The transverse posterior line is most nearly complete, but never continuous, so far as my specimens show. At its best it is somewhat lunulated, only a little sinuate, more emphasized opposite the cell and the anal angle. When least marked there is only a black spot or two opposite cell, and a black lunule opposite the anal angle. There is every possible intergrade between these two forms. Opposite the cell there is usually an indication of a short, black streak from the transverse posterior line, and opposite the anal angle there is a similar indication emphasized by a blackish shading. In rare instances this black mark extends across the line inwardly. The terminal space is a little darker than the rest of the wing. There is a series of black terminal dots, beyond which the fringes are cut with black. There is a short black basal streak which does not extend to the transverse anterior line, and does not connect with the angular mark which represents that line in most of the specimens. The orbicular is wanting, or is at most very faintly indicated. In one specimen only of all those before me is it outlined in black. The reniform is a vaguely defined, blackish, lunate mark. Secondaries white, the fringes marked with a series of black dots at base. Beneath white, with a more or less distinct outer line and discal spot. The spots at the base of the fringes are also duplicated from the upper side.

Expanse, 1.30 to 1.90 inches (33 to 47 mm.).

Habitat.—Canada; London, Ontario, May 29; Urbana and Chicago, Illinois, June 28; Massachusetts; New York; Long Island; Missouri in May; Kansas; Nebraska; Seattle, Washington.

Twenty-four specimens, almost evenly divided as to sex, are before me from the various localities mentioned. All the dates are in May and June, and the specimens run quite evenly and without any marked variation. The absence of the orbicular and the very short basal streak will serve to distinguish this species in all cases. From its near ally *lepusculina*, with which it has been generally confounded, it differs by the broader wings of the female, by a paler and less apparent ground color, as well as by the basal dash and orbicular, as already mentioned. Altogether the species has a very distinctive look when the specimens are brought together and separated from the others. The front is moderately bulging, but is not prominent, while the palpi never exceed the middle, and sometimes do not reach it. The genitalia of the male have the side pieces broad, very obtusely and somewhat irregularly rounded at the tip, while the clasper is of moderate length and rather slender. The legs are moderately stout, the femur quite evenly proportioned, the tibia with the epiphysis extending to the tip, as is usual in this section. Compared with *leporina* the species is narrower winged and more powdery, and the markings are a little more complete; otherwise the resemblance is close.

LARVA.

Riley, Second Rept. Ins. Mo., 1870, p. 119, (*populi*).—French, Trans. Dept. Agr., Ill., 1877, XV, p. 201.—Marten, Trans. Dept. Agr., Ill., 1880, XVIII, p. 130.—Saunders, Can. Ent., 1882, XIV, p. 221, fig.; Rept. Ent. Soc. Ont., 1883, p. 24, fig.

Stage IV.—Width of head, about 2 mm. All whitish, with a greenish tint. Hair long and white, with black pencils on joints 5, 7, and 12, and a few black hairs the whole length from tubercles I and II, almost forming a pencil on joint 8.

Stage VI.—Width of head, 4 to 4.8 mm. Shining black, as, also, the cervical shield and thoracic feet. Body covered with long, light yellow secondary hairs; five single dorsal black pencils from tubercle I on joints 5, 7, 8, 9, and 12. Those on joints 5 and 12 are the most persistent; some or all of the others may be weak or absent. Skin sordid white; brownish dorsally on joints 3 and 4. Warts small, concolorous, obscure; hairs simple, very long, not obscuring the body. Venter shaded with brownish; leg plates partly black. Spiracles black rimmed.

Cocoon.—Composed of silk and chips of wood.

Pupa.—Robust, the abdomen regularly tapering, the segments coarsely, rather densely punctured anteriorly; wing cases creased and shagreened. Cremaster large, thick, constricted at the base, coarsely densely wrinkled; upper hook single, strongly recurved; lower hooks, four or five on each side, well separated and bent down subparallel to the surface of the pupa.

Food plant.—Poplar.

ACRONYCTA LEPUSCULINA Guenée.

(Plates I, fig. 1, adult; XI, fig. 8, female adult; XIX, fig. 21, male genitalia.)

Acronycta lepusculina GUENÉE, Spec. Gen., Noct., 1852, I, p. 46.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 55.

Apatela lepusculina GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 130; Can. Ent., 1874, VI, p. 154.—HENRY EDWARDS, Ento. Amer., 1888, III, p. 185.

Ground color white, quite strongly powdered with black. The ordinary lines distinct in most cases and always traceable. Basal line marked by a black spot on the costa. Transverse anterior line marked by a black costal spot, and from this point it is geminate, with an even outcurve, to the middle, where it meets the basal dash and begins another even outcurve to the internal margin. The line is rarely entirely complete, but its geminate character is marked in all the specimens that are before me, and it is in almost every instance traceable on both sides of the basal streak. The median shade is marked by a black spot on the costa, and as a rule extends across the reniform, but not beyond. The transverse posterior line is quite usually complete, lunulate, and quite strongly dentated on the veins; sometimes the line is quite narrow, and sometimes dentated in both directions. More usually the lunules are quite distinct, generally the line is somewhat emphasized opposite the cell, and is also more distinct opposite the anal angle, where it is usually crossed by a black dagger mark. There is a series of terminal dots, beyond which the fringes are cut with black. There is a distinct black basal streak, which extends to and is connected with the transverse anterior line. The orbicular is marked in all the specimens that I have seen, and, though small, is black ringed. The reniform is usually an indefinite dusky lunule, but is sometimes completely outlined and large kidney shaped. The secondaries are white, usually with a terminal dark line, sometimes with a series of terminal dots. Beneath white, more or less powdery, with an outer discal line and a more or less evident discal spot.

Expanse, 1.50 to 2 inches (37 to 50 mm.).

Habitat.—Long Island, New York; Manchester, New Hampshire; Florida; Kansas in September; Volga, South Dakota; Colorado; Montana.

The only date of capture that I have for this species is September, and unfortunately the entire collection contains only nine specimens. These, however, run very constant, and in the characters that I have pointed out differ strongly from *populi*. I have selected this species as the type of Guenée's description, because it is, without any doubt, included by him in his characterization. It is also quite certain that Riley had both forms before him when he described his species; so, strictly speaking, the names referred to the same aggregation of examples. As there are two forms, however, and as Riley's figure and type refer distinctly to the form in which the basal streak is very short, it seems fair to retain his name and to apply Guenée's term to the other form, which has been mixed with it. One other point that was not mentioned in the description of the preceding species as distinguishing it from the one now under consideration is that here the transverse anterior line is in almost every case more or less evident, and yet distinctly geminate. In no example of *populi* do we find any approaching to this. The species is, on the whole, narrower winged, and as it is also more coarsely black powdered it has quite a distinctive appearance. In male genital characters it does not differ essentially from the preceding; but the side pieces are rather narrower as a whole, while the clasper is shorter and proportionately very much broader.

ACRONYCTA CINDERELLA, new species.

(Plates XI, fig. 11, male adult; XX, fig. 1, male genitalia.)

Ground color very pale ash gray, almost whitish, but with coarse black powderings, which give it the ashen appearance. Head and thorax of the ground color as is usual. The primaries have the ordinary markings rather imperfectly written. The basal line is marked by a small black dot on the costa, very close to the base. The transverse anterior line is more or less complete; in one case entirely distinct, but in most instances only partly defined. It is always geminate, however, so far as it is obvious. In the worst case it is marked by a distinct costal spot, by a pair of angulated marks below the cell, and by a pair of spots on the internal margin. A black spot over the reniform marks the origin of the median shade, which is not traceable, however, beyond that point. The transverse posterior line is continuous in all the specimens, usually lunulated and sometimes quite strongly dentate on the veins. It may or may not be emphasized opposite the cell; but is always marked opposite the anal angle where there is also a slender black line crossing it. The terminal space is a little darker than the rest of the wing. There is a series of black terminal dots, beyond which the wings are cut by blackish marks. The basal streak is distinct for half its length, and beyond that lessens to a narrow line which reaches the transverse anterior cross line. This difference in the strength of the line is noticeable in all the specimens. The orbicular is marked in all the specimens, irregularly oval and black ringed. The reniform is a dusky, indefined lunule. Secondaries white, with the outer margin a little soiled, a series of blackish terminal marks beyond which the fringes are cut with dusky. On the under side the wings are white or nearly so, powdered, with a more or less obvious outer line and discal spot.

Expanse, 1.25 to 1.80 inches (32 to 45 mm.).

Habitat.—Colorado, without date or definite locality; Miles City, Montana, June 3.

Five males and two females are at hand for comparison. The species is most nearly like *lepusculina;* but it differs by the much darker ground color, the somewhat narrower and more powdery primaries, while the transverse posterior line is continuous in all the specimens. The harpes are narrower and more pointed than in its ally, and the clasper is quite stout and well developed. The front is moderately bulging, but not prominent. The palpi reach to its middle and in leg structure it does not differ apparently from *lepusculina.*

ACRONYCTA TRANSVERSATA, new species.

(Plates X, fig. 10, male adult; XX, fig. 3, male genitalia.)

Ground color ashen gray, distinctly and quite densely black powdered. The head and thorax are, as usual, without markings except for a black line reaching to the base of the primaries from the sides of the palpi. The ordinary maculation is more or less distinctly traceable in all the specimens before me, though never quite complete. The basal line is marked by a black spot on the costa. The transverse anterior line is marked by a black spot on the costa, which is sometimes double, by a pair of angulated marks below the cell, and by one or two lunules on the inner margin. In one case the connection between these spots and marks is almost complete, so there is nearly a full transverse anterior line. The median shade is marked by a blackish spot on the costa, extending obliquely to darken the reniform, thence abruptly bent and running parallel with the transverse posterior line to the inner margin. The transverse posterior line is well marked, continuous, narrowly lunulated, more or less obviously marked opposite the cell, where there is usually a distinct dagger. The line is black shaded opposite the internal angle, and there is an evident dagger crossing it. The terminal space is darker than the rest of the wing, and there is a series of small terminal dots, beyond which the fringes are cut with black. The black streak at the base is distinct and extends without break from the base to the transverse anterior line. The orbicular is round, or nearly so, black ringed. The reniform is indefined and dusky. Secondaries white, or nearly so, in the female outwardly soiled. Beneath whitish, with a more or less complete outer line, and an obvious discal spot on all wings.

Expanse, 1.60 to 1.80 inches (40 to 45 mm.).

Habitat.—Colorado, no date or special locality.

Three males and one female of this species are at hand, and it differs obviously from all those that have preceded it by the complete median shade line. It is also somewhat darker than any of the other species, and is narrower winged in both sexes. On studying a series of species beginning with *cretata*, we find a very pretty and gradual development from a perfectly white form, in which the markings are all blotchy and the wings in the female are very broad, through a very similar type seen in *leporina*, to a more powdery but still broad-winged form like *populi*, all with only a short basal streak; then a form like *lepusculina*, where all the markings tend to become complete, to *cinderella*, where they are nearly so, to *transversata*, where the median shade line first becomes distinct throughout its whole course. In this species we have the most completely marked type, and also the narrowest wings in both sexes. There is little variation in the specimens before me, but probably the range is greater than is indicated by my specimens. It is not inconceivable that this is an extreme form of the species just previously described, and there is nothing in the structural characters opposed to that idea. As the material stands now, however, the species is well based, and is recognizable by the characters already enumerated.

ACRONYCTA TOTA Grote.

(Plates X, fig. 11, female adult; XVII, fig. 17, leg; XIX, fig. 23, male genitalia.)

Apatela tota GROTE, North Am. Ent., 1879, I, p. 12; Papilio, 1883, III, p. 69.

Ground color a very dark blue ash gray, with dense black powderings. The basal line is feebly or not at all marked. Transverse anterior line distinct throughout its entire course; geminate nearly upright, just a little drawn in below the cell. The two parts of the line are quite well separated, leaving the ground color visible between. The median shade is marked on the costa, but not prominent, and is vaguely extended to the reniform. The transverse posterior line is unusually near the outer margin; is more or less distinctly geminated, the outer line most distinct, while the included space is pale. It is very even, and as a whole not very strongly bisinuate. There is a series of black terminal dots, and the fringes are rather indistinctly marked with smoky. The black basal streak is distinct and extends to the transverse anterior line without break. There is no dagger mark or other shade emphasizing the transverse posterior line. The orbicular is small, nearly round, black ringed. The reniform is very large, kidney shaped, completely ringed, and with a dusky inner lunule. The secondaries are white in the male, smoky in the female, in which sex there is also a distinct discal spot, and a pale outer line running through the smoky exterior part of the wing. Beneath, the wings are whitish, with the usual discal spots and outer line.

Expanse, 1.28 to 1.40 inches (32 to 35 mm.).

Habitat.—Texas in March.

Eight specimens are before me, most of them females, and four of them collected by Belfrage. One specimen is marked Comal County, and is the only one with a definite locality. This species can not very well be mistaken for anything else. It is the smallest in this group, as well as the darkest and most simply marked. There is absolutely nothing to compare with the unique, geminate, transverse anterior line, which will serve to characterize the species. The harpes are almost ovate, at least half as broad as long, and the clasper is stout and well curved. The anterior leg is also well developed for an insect of this size, but rather in the tibia and tarsi than in the femur. The epiphysis is, as usual, attached to the middle and extends to the tip. The head is larger in proportion to the size of the insect than is usual in this genus; but the palpi, on the other hand, are very short, scarcely even reaching beyond the edge of the front. The latter is a little convex, but scarcely bulging.

Group LOBELIAE.

The most obvious superficial characters of this group are the usually prominent *psi* or dagger marks, and the moderate primaries in which the inner margin is not much shorter than the costa. The outer margin is quite evenly arcuate, only a little oblique, and the apex is rectangular, or even a little rounded. The costa is rather evenly arched and does not form a shoulder, so the wing seems trigonate rather than subequal. Yet the group as defined above is not a strictly natural one, and it has been impossible to so arrange the species in tabular form as to show relationships. On the other hand, while the sexual structures of the male serve to mark two very distinct subgroups, there are offshoots that confuse. The best-developed type may be considered that found in *hasta*, *furcifera*, and *laetifica*, in which the lateral clasper is separated from the harpes, is broad, scoop-shaped, and has a long, finger-like projection superiorly. Roughly, the structure may be compared to a hand from which thumb and all save the index finger have been removed, the palm being a little doubled up. To this structure is added, in *lobeliae* and several allied forms, a finger-like process which arises superiorly, as if to the structure above described the thumb had been added and extended at right angles to the palm. The size and form of this upper process varies, and sometimes the palm or scoop adds an inferior process, as if part of the little finger had been also restored. This we find illustrated in *pruni*. In *brumosa* (*subochrea*) we find a break in a new direction. The thumb or upper process becomes longer and more slender, the palm becomes more flattened, and the upper process is beak-like. It is an obvious member of the *lobeliae* type, but it introduces the structures which become fully developed in the *persuasa* group.

With *lithospila* begins another break. The palm becomes reduced in size, the upper margin bends over, the finger process thus becomes somewhat beak-like, while the thumb becomes more slender. In *tritona* the process is continued, and we get a structure that consists of a long, excavated, tapering process, with a slender finger-like structure from its superior margin. Dropping this superior finger-like structure, we get *vinnula*, but if we reduce it in size and make the process itself beak-like we get first *parallela* and finally *grisea*, in which only the beak-like process is developed. In *connecta* the clasper, while it strongly resembles that of *tritona*, becomes inferiorly united with the sidepiece, the superior process becomes larger and more prominent, and apparently arises much nearer the middle of the harpes. In *fragilis* and *funeralis* there is a curious similarity in development. The inferior portion of the clasper is somewhat flattened, united to the harpes except at the tip where it is freed, and has the inferior angle prolonged. From these forms the transition into the *hamamelis* type is easy and requires only the loss of the inferior process of the clasper.

In this connection a study of the European *psi*, *cuspis*, and *tridens* is interesting. None of them lack the superior process and none of them have the scoop-shaped clasper distinctly developed. *Cuspis* is curiously intermediate between *lobeliae* and *persuasa*, while in *alni* we see distinctly the structure which brings *funeralis* close to *afflicta*, while also indicating the *tridens* derivation. *Tridens* is most nearly like *lithospila*, while *psi* contains all the *hamamelis* possibilities and those of the group *auricoma*. None of the species examined by me show any resemblance to our *grisea* type, while on the other hand we have nothing in the least resembling *megacephala*.

As we find thus, in the sexual structures, variations in several directions, so we find in the adults that from the strongly developed *psi* type the maculation tends to the strigate *lithospila*, to the dentate *fragilis*, to the powdery roughened *superans*, and to the smooth, uniform, cleanly defined type in *falcula*, *parallela*, and allies. The same type of maculation is duplicated in two or more divisions; hence any arrangement on superficial appearance will be certain to contradict that made on structural characters merely. For convenience of determination, superficial characters will be used in the table and in the review of the species.

While there is no absolute agreement, nevertheless as a whole the members of this group have the epiphysis of the anterior tibia of the male inserted at or above the middle, the lappet not reaching the tip of the member, while the tarsi are proportionately longer.

First of all we may separate *innotata* and *betulae* as having no black lines, streaks, or dagger marks of any description. The wings are a little shorter and broader than usual, but the general scheme of maculation is similar. *Innotata* is white or yellowish, with the transverse posterior line emphasized by black scales, while *betulae* is of a peculiar reddish clay or luteous, without a trace of black anywhere.

Morula, *occidentalis*, *paupercula*, *vinnula*, and *fragilis* are united by having a black streak at base, a dagger mark, which may or may not cross the transverse posterior line, opposite the anal angle, and another, much less marked, opposite the cell. The ordinary spots are not in any way united or tied by a black line or mark. The vestiture is smooth, and the markings are not picked out by raised scales. *Morula* and *occidentalis* are allied in sexual structure to each other and to *lobeliae*; *paupercula* and *vinnula* are much more nearly allied to *tritona* and *grisea*, while *fragilis* stands pointing to *funeralis*, *hamamelis*, and *grisea*, with indications toward *connecta* or *tritona*.

Morula is easily known by its large size, its discolorous yellow thoracic disk, and the yellowish shades in the primaries.

Occidentalis is very similiar, but much smaller, and the thoracic disk is not yellow or otherwise discolored. In the structure of the male claspers the species differ little. In *occidentalis* the process from the superior margin is reduced to a small angulation, while in *morula* it is a flat triangular process.

Paupercula might pass for a small *occidentalis*, but it has a reddish shade, and the black streak from the base to the transverse anterior line is very heavy, and has a small spur or angle inferiorly as if the line had started to divide, and in this character it agrees with *vinnula* and all the species that have the same general type of genital structure. This seems at first sight like a very small character; but it is constant within specific limits, and all the species with similar male claspers have this spurred or broken basal streak. Unfortunately, some of the species with a diffuse streak sometimes have a similar spur, so that the character is not satisfactory for isolating just this group.

Vinnula is unique by its glistening white vestiture, which is marked by bluish, brown, or mossy-green shadings. All the transverse lines are well developed, and there is also a very distinct median shade line.

Fragilis is unique. The wings resemble the *albarufa-hamamelis* type, the ground color is smoky brown or blackish, and the very strongly dentate black median lines carry contrasting white accompanying shades. Altogether it is easily separable from all others in the section, to which only its superficial characters refer it.

Laetifica, *furcifera*, *hasta*, *manitoba*, *thoracica*, and *strigulata* agree in a general resemblance to the preceding series, but have the ordinary spots distinctly tied or connected by a black streak or dash or curved line. Of these the last-mentioned two have a discolorous thoracic dorsum and a tendency to strigate maculation, while all the others are normal in this respect. All the species grouped here are allied in genitalic structure and, except for the strigate forms, resemble each other closely.

Laetifica differs from the others of the series by the pale, milky-white primaries, in which it agrees with *occidentalis*. The species has been confused with *furcifera* which it does not resemble at all, and with *occidentalis*, with which small, obscurely marked examples may be confounded. These small specimens, however, in which the connecting mark between the ordinary spots is sometimes wanting on one or both sides, have the secondaries very dark, smoky brown, and the black markings of the primaries much thicker and more prominent than in *occidentalis*.

Lobeliae is the largest of this series in average expanse and much the best marked. All the black dashes and dagger marks are fully developed, and the basal streak is heavy and crosses the transverse anterior line in most instances. The ground color is. on the whole, only a little darker than in *lactifica*.

Furcifera is a decidedly darker, bluish-gray species, and distinctly smaller in average size. Yet a large *furcifera* may fully equal a small *lobeliae*, and in that case the darker ground color of the present species and the darker, smoky secondaries may be relied upon. As a rule the basal streak, though as prominent as in *lobeliae*, does not cross the inner transverse anterior line, and the dagger mark opposite the cell is less prominent and rarely crosses the transverse posterior line. Though on superficial characters there may be occasionally a doubt as between *lobeliae* and *furcifera*, the male claspers of the former have always a long finger-like process from the upper margin, of which those of *furcifera* show no trace.

Hasta is very closely allied to *furcifera*, and the species are mixed in almost all collections. With a series of both species at hand separation is easy; with a few specimens only there may be doubt. *Hasta* as a whole is of a clearer ashen-gray ground color, to which the smoky shadings give a peculiar mottled appearance which is not present in *furcifera*. In the latter species the secondaries are in the male distinctly smoky, while in *hasta* they are almost white, with only a slight smoky yellowish tinge. In the female the difference is less obvious, but also present. The male genitalia are practically alike in the two species.

Manitoba is a very distinct species, continuing in the direction in which *hasta* diverges from *furcifera*. The primaries are yet clearer ash gray, the mottling tends a little to the strigate type, and the secondaries in the male are white, with only a very narrow, soiled outer edge.

Thoracica is yet paler, the transverse anterior line is almost lost, and the strigate character of the marking is obvious. Besides the discoloration of the thoracic disk, there is a vague yellowish shading in the primaries. A prominent black streak extends from the costa obliquely outward between the ordinary spots, which are very close together and not at all well defined.

Strigulata forms the end of this line, with very pale blue-gray strigate primaries, in which nearly all the tranverse maculation is obsolete, and pure white secondaries in both sexes. The discolored thoracic tuft is small and sometimes almost obsolete; but the relationship to *thoracica* is evident.

Lithospila, with its strigate, dark, smoky, blue-gray primaries, is unique and not easily mistakable. The transverse maculation is practically obsolete, the ordinary spots are barely traceable, and there are no obvious streaks or dagger marks. Altogether the species is intermediate and leads toward the *tritona-grisea* series on one hand and to *alni* on the other.

Tritona, *revellata*, *grisea*, and *radcliffei* are blue-gray species which have no dagger mark opposite the cell; but do have such a mark crossing the transverse posterior line opposite the anal angle. Except *radcliffei* these species are allied in structure, *tritona* forming the intermediate type to the typical *grisea* form. *Radcliffei* in structure resembles *occidentalis* or *lobeliae*, but differs from all the other species in that series by its very even gray primaries, on which the markings are very neatly defined, the dash opposite the cell being entirely absent in all the specimens seen by me.

Tritona is very dark, the tint being also very even. The transverse anterior line is altogether wanting, but the transverse posterior is distinct, and the *psi* mark opposite the anal angle is very prominent.

Revellata and *grisea* have powdery gray primaries and almost white secondaries. The maculation is well written in both, but the former is larger, a little darker, yet brighter and more contrasting. The former occurs in the Rocky Mountains, the latter is northeastern.

Quadrata, *falcula*, and *parallela* resemble *grisea*, but are very evenly colored, and the black line opposite anal angle does not cross the transverse posterior line.

Quadrata is very distinct, and recognizable at once by the fact that the space between the ordinary spots is filled by a somewhat quadrate black spot. The species is quite unique in this respect, but while the superficial appearance refers the species here, the male genitalia are like those of *occidentalis*, and, like *radcliffei*, this species is evidently an offshoot from the main line of development.

Falcula and *parallela* are closely allied and structurally near to *grisea*. The primaries are a very even blue gray, darker in *falcula*, and the markings are very neatly defined. In *falcula* the base is shaded with orange inferiorly, and there is a distinct orange shade beyond the transverse posterior line. In *parallela* these shades are wanting or at most very feebly indicated, and here the secondaries are white in both sexes, while in *falcula* those of the female at least are distinctly smoky.

Mansueta and *funeralis* have in common only the black shading along the inner margin of the primaries. Omitting this black shading, *mansueta* is intermediate between *grisea* and *parallela*, and so the male genitalia refer it.

Funeralis is unique in all respects, yet when the wing form and the markings are considered closely it finds its nearest allies here. The peculiarities of the male genitalia have been already referred to. Above the middle the primaries are white, mottled with bluish, while the black shading along the internal margin is very well defined and sends up a distinct spur on the transverse anterior line.

All the others in this series have the vestiture more or less roughened and the scales somewhat elevated. Almost all these species are somewhat aberrant, not very nearly related, and pointing in different directions.

Spinigera and *pruni* are most nearly allied and are evident offshoots from the typical *lobeliae* type, which they resemble in maculation and in the genitalic structure of the male. The roughening of the vestiture is quite evident enough to separate the species from their allies, but it is not a striking feature, and serves rather to give a peculiar softness and indefiniteness to the ornamentation.

Spinigera, or *harveyana*, as it has been renamed, is somewhat less squamose in appearance, and has all the dashes slender and neatly defined. The genitalia of the male are of the *lobeliae* type, but show a departure from the normal in the development of a knob-like process from the inferior margin.

Pruni, which is generally known as *clarescens* in collections, is smaller, much more roughened in vestiture, and the dashes are all obscured or diffuse, particularly that opposite the anal angle. The genitalia of the male differ from the normal *lobeliae* type in that both angles of the scoop-like clasper are prolonged into finger-like processes.

Superans is quite unique in this series in its general appearance, yet on close study it is apparent that we may have here an extreme development of the tendency started in the preceding species. All the markings are normally present, but everything is obscured by the elevated, rough vestiture, aided by a general blackish suffusion which gives the primaries a marbled appearance. In a general way the ground color is gray, but there is a broad smoky or blackish longitudinal shade which extends from base to outer margin below the center of the wing, and this is joined by a broad band which extends transversely from the costa just beyond the orbicular. Another peculiarity is a patch of yellow scales at the extreme base, inferiorly, that contrasts sharply with the rest of the wing. The claspers of the male are but little different from those of *lobeliae*.

Connecta is a much reduced *superans* in maculation, but so modified as to give quite a different first impression. The ground color has a faint reddish shading; the longitudinal black shade is better defined and much more contrasting, and the dusky shade from the costa is more diffuse and much less prominent. The relationship to *alni* and *funeralis* is evident, as is that to *grisea* through *mansueta*. In the structure of the male claspers we have a very interesting intermediate form. It would require little change to develop into the *lobeliae* type on the one hand, to the *afflicta* form on another, to the *grisea* type in the third, and even the form of the *auricoma* group could be easily secured. The species is, therefore, a highly important and interesting one.

Brumosa Guenée, which replaces *subochrea* Grote, is an extreme development of the line started by *spinigera*. It is very dark blue-gray, the markings obscure, diffuse, and mottled, and the secondaries smoky luteous, but glistening. In well-marked specimens all the ornamentation of *pruni*, but much obscured, are easily traceable. In male genital structure this species is distinctly unique, and while it is evidently a *lobeliae* derivative, becomes an easy intergrade to the *afflicta* type.

Of the European species known to me, *psi*, *tridens*, *cuspis*, *strigosa*, and *alni* belong to this group. All of these save *strigosa* have been already mentioned. Of these, the first-mentioned three belong to that small series of which *lobeliae* is typical. All have the dagger opposite the cell more or less obvious and crossing the transverse posterior line, and all have the ordinary spots more or less distinctly tied by a black line or dash. In all the basal dash or streak is distinct, and in all we find well marked the spur from the inferior margin, which, in our own species, is characteristic of the *grisea* series. The structure of the male genitalia has been already referred to, and, altogether, while at first sight there may seem a close resemblance between these European and some American forms, yet they are really quite remote from each other. Variation has been much greater and specialization more active in America; hence our species have diverged more and in a greater number of directions.

In its pattern of maculation *alni* resembles *superans* and *connecta* at least as much as, if not more than, it does our *funeralis*. It has not only the longitudinal shade of *superans*, but also the broad shade bands extending from the costa behind the orbicular to meet it. So the vestiture in *alni* is much more roughened than it is in the American species, and in this particular it is also much closer to our *connecta*.

Strigosa is the European representative of our *connecta*, but is smaller, more slightly built, and more brightly colored. The male claspers are those of *connecta*, but on a much smaller, more compact plan, and much better adapted for a starting point to our group *hamamelis* or to the group *auricoma*.

ACRONYCTA INNOTATA Guenée.

(Plates II, figs. 17, 18, adult; XVII, fig. 18, leg; XX, fig. 5, male genitalia.)

Acronycta innotata GUENÉE, Spec. Gen., Noct., 1852, I, p. 50.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 59.

Apatela innotata GROTE, Papilio, 1883, III, p. 114.

Diphthera graefii GROTE, Proc. Ent. Soc. Phila., 1863, II, p. 68, pl. III, fig. 6.—MORRISON, Can. Ent., 1875, VII, p. 79, pr. syn.

Ground color a somewhat dirty yellowish white. Head and thorax without distinct markings, except a black line from the sides of the palpi to the base of the wings. Primaries with the ordinary lines traceable, and a variously distinct basal line, marked by a black spot on the costa. Transverse anterior line marked by a black spot on the costa. Beyond that it is geminate, neither of the defining lines complete nor always well marked at the same points. As a whole the line is outwardly oblique and rather even. Sometimes it is reduced to the costal spot, to a dot or a pair of dots below the cell and another on the internal margin; occasionally it is entirely wanting. The median shade is indicated by a black spot on the costa and sometimes a shade extends to the center of the reniform. The transverse posterior line is well marked, in most specimens continuous or nearly so, more or less obviously lunulated, but not dentated on the veins. It is quite squarely bent out over the cell and with a well-marked incurve opposite the anal angle. There is a series of terminal dots, but the fringes are not cut. There is no longitudinal line at base and the orbicular is wanting in most specimens. Occasionally it is marked by a feeble dot and sometimes even by a small ring. The reniform varies from a distinct black crescent mark to a vague dusky lunule. Secondaries white in the female, with a more or less obvious discal mark and an outer median line which is sometimes marked in the middle on the veins. In both sexes there is a series of blackish terminal marks. Beneath there is the usual outer line and the discal lunule on both wings.

Expanse, 1.40 to 1.85 inches (35 to 47 mm.).

Habitat.—London, Ontario, June 28; Maine in June; New Hampshire; Rochester, Ithaca, Long Island, New York; Pennsylvania.

This broad-winged species can not be easily mistaken. Its pale colors and simple markings, without trace of black dashes or dagger marks, are quite characteristic. It varies from a form in which all the described markings are easily distinguishable to one in which nothing except the transverse posterior line is evident, and even this hardly black marked. It is rather common within its range, which seems to be not very extended, and thirty or forty specimens have been examined. The head is very distinct, the front a little bulging, the palpi well developed and reaching the middle in most of the specimens. The legs are stout and the femur is quite strongly dilated and abruptly narrowed at the tip. The tibia is slender, the epiphysis inserted at about the middle, but not reaching to the tip. The tarsus is long in proportion to the rest of the leg. The harpes of the male are narrow and subequal. The clasper is of the usual form, with the upper finger stout and long, while the process from the upper margin is short and rather slender.

LARVA.

BEUTENMÜLLER, Ent. News, 1891, II, p. 153.

Stage VI.—Head pitchy brown on the vertices of the lobes; face sordid white; body dull grayish brown; warts I and II shining black; two rows of yellow spots along each side, with a row of black spots [or tubercle III?] between; legs concolorous; secondary hair sparse, sordid white; venter dull grayish.

Cocoon.—Of bits of wood rudely united.

Food plant.—Probably hickory (after Beutenmüller).

ACRONYCTA BETULAE Riley.

(Plates II, fig. 19, adult; V, figs. 4, 5, larva; XVI, fig. 9, venation; XVII, fig. 19, leg; XVIII, fig. 6, palpus; XX, fig. 6, male genitalia.)

Acronycta betulae RILEY, Bull. Bkln. Ent. Soc., 1884, VII, p. 2, fig. 1.
Apatela betulae PACKARD, Forest Insects, 1890, p. 495, fig. 176.
Hyboma betulae GROTE, Mitth., a. d. Roem. Mus., Hildesh., 1896, No. 3, p. 7.

Ground color a rather pale ocher yellow, shading into luteous. Head and thorax even, the usual black line at the sides of the palpi becoming brown; primaries with the ordinary markings very little defined and never contrasting. The basal line is feebly marked on the costa, or is entirely absent. The transverse anterior line is geminate, oblique, very even but very faintly marked; the defining lines are only a little darker than the ground color, even on the costa. The median shade is marked by an oblique dash on the costa extending to the reniform, and in some specimens inwardly bent and traceable to the inner margin at its middle. In most specimens this shade is not traceable beyond the costa, and it is never more than dusky even here. The transverse posterior line is narrow, rather sharply defined, irregular, distinctly toothed on veins 3 and 4, and with a sharp inward bend in the submedian interspace, forming a blunt tooth. Beyond this line there is a dusky shade which follows what would ordinarily be the subterminal space were a subterminal line defined. There are no terminal dots, and the merest trace of a terminal line is indicated in some specimens. There is no basal dash; the orbicular is absent or vaguely defined. The reniform varies from an indefined lunule to a large reniform spot, and is of a little richer brownish color than the ground. Secondaries of a paler shade of luteous, with a vaguely indicated discal lunule and outer line. On the under side we have the same general color, but paler, and the usual outer line and discal spot. The outer line in this case is quite distinctly angulated at about its middle.

Expanse, 1.40 to 1.48 inches (35 to 37 mm.).

Habitat.—Washington, District of Columbia, March and August; Long Island, New York; Pennsylvania; Missouri; Jefferson, New Hampshire.

Twelve specimens have been examined and offer very little variation. It is simply a question of the greater or less distinctness of the markings. Its nearest ally in appearance is *innotata*; but there is no chance of mistaking the species. In structure it resembles *innotata* in the frontal characters and in the general character of the legs. The harpes of the male taper quite regularly to a blunt tip. The clasper, while of the general shape of *innotata*, is more clumsy, and lacks the process from the superior margin.

LARVA.

RILEY, Bull. Bkln. Ent. Soc., 1884, VII, p. 2.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 495.

Stage IV.—Width of head, 1.35 mm. Green; the warts yellow. A dorsal yellow line, faint and broken, with traces of a subdorsal one on the thorax. Dorsally on joints 5, 8, 9, and 12, and faintly on 11, small brown patches surrounded with yellow, most distinct on the sides. Dorsal hair long, dark, a central seta with a crown of short hairs from each wart. Joints 5 and 12 slightly enlarged.

Stage V.—Head green, with purplish mottlings on the lobes, the apices pale brown: width, 2.2 mm. Body green, the warts and dorsal line yellow on joints 4 to 12, yellow elliptical patches covering warts I and II on joints 5, 8, 9, and 12, with red centers; a red dot on joint 11. Only a trace of the subdorsal line on joints 3 and 4. Skin granules sparse, with short pile and a few true secondary hairs. Primary hairs few. Later the dorsal brown dots become more numerous, small on joints 4, 6, 7, large on 8, 9, small on 10, 11. Dorsal line enlarged to include tubercle I on joints 8 and 9, I and II on joints 5 and 12.

Stage VI.—Head pale brownish, thickly mottled with black spots above, the apices of the lobes orange; width, 3 to 3.7 mm. Body, dull olivaceous brown; minute brown-black skin thorns on a greenish ground. No marks on the skin except a faint, pale dorsal line. Joints 5 and 12 a little enlarged dorsally, 12 square. Warts small, few haired, I and II black, but with pale hair tubercles, the other warts pale greenish; all pale on joint 13. Hair short, black and white; secondary hairs present only subventrally, but rather abundant there, pale.

Cocoon.—"Web up in a piece of old wood or between leaves." (Riley.)

Pupa.—Cylindrical, regularly gently tapering, the abdominal segments punctured in front; smooth, shining brown, the wing cases finely transversely wrinkled. Cremaster short, nearly sessile, several longitudinal ridges above and below at the margin. No dorsal hooks, the lower row in a close series of six, corresponding to three on each side, but not separated. Length, 17 mm.; width, 8 mm.

Food plant.—Birch.

ACRONYCTA MORULA Grote and Robinson.

(Plates II, fig. 10, adult; VII, figs. 20, 21, larva; XIV, figs. 7, 13, thorax and male genitalia; XV, figs. 12, 17, head; XVII, fig. 20, leg; XX, fig. 7, male genitalia.)

Acronycta morula GROTE and ROBINSON, Trans. Am. Ent. Soc., 1868, II, p. 196, pl. III, fig. 75.—LINTNER, Ent. Cont., 1878, IV, p. 137.

Apatela morula THAXTER, Papilio, 1883, III, p. 13.—GROTE, Papilio, 1883, III, p. 67.—PACKARD, Forest Insects, 1890, p. 272.

Hyboma morula GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Acronycta ulmi HARRIS, Ent. Corresp., 1869, p. 312.—SMITH, List Lepidoptera, 1891, p. 35, pr. syn.

Ground color a pale ashen gray, with a yellowish tinge. The thorax has the disk distinctly yellow, the collar is usually brown-tipped, and the edges of the patagiae are narrowly black marked. The primaries have all the markings traceable and in most instances fairly distinct. The basal line is marked by geminate yellow or brown marks on the costa. Transverse anterior line geminate, brownish yellow, as a whole outwardly oblique, quite strongly toothed on the subcostal and more or less distinctly out-bent on all the veins. The tendency is for the line to become faint or entirely wanting below the middle, and it is often indistinct, even in the upper part of its course. The median shade is marked by a rather defined yellow or brown line from the costa obliquely to the reniform, and occasionally there is a very even shading which extends almost or quite to the inner margin. The transverse posterior line is narrow, brown or black, distinctly defined, preceded by a paler and followed by a darker brownish or yellow shading. The line is rather even, most sharply toothed on veins 3 and 4, below which it makes a deep incurve opposite the anal angle. There is an indistinct but traceable subterminal line in most of the specimens which is irregular and paler. The fringes are cut with brown or black opposite the interspaces. There is a distinct basal dash which is black and extends through the basal line. There is a dark dash opposite the cell, which extends from the transverse posterior line to the outer margin and sometimes crosses the line inwardly. Another dash opposite the anal angle extends from the margin through the transverse posterior line, forming a distinct *psi*, which is shaded with blackish and quite prominent. The orbicular is small, round, ringed with brown, yellow, or black. The reniform is large, kidney shaped, somewhat indefined, except at its inner edge, where it is black marked. As a whole it is shaded with yellowish. The secondaries are smoky, darker in the female, and with a more or less obvious discal spot and outer line. Beneath the color is yellowish white, powdery, and on both wings, with an incomplete outer band and a rather distinct discal spot.

Expanse, 1.60 to 2 inches (40 to 50 mm.).

Habitat.—Ontario, Canada; Rochester, New York; Kendall, New York; Long Island, New York; Otto, New York, July; Evans Center, New York, July; Wisconsin; Central Missouri in May; Washington, District of Columbia, in August; Maine; Illinois; Pennsylvania; Texas in June.

In a general way this insect occurs west to the Rocky Mountains from Canada southward. Some twenty-odd specimens of each sex have been examined and very little variation occurs. Some specimens are a little paler, some a little darker; some of them are a little brighter marked than others; but on the whole the species is remarkably constant and is always easily recognized by the yellowish shading in the fore wings and by the yellow disk of the thorax. It is also the largest species next to *lobeliae* with which it can not be easily confused. The front is bulging but hardly protuberant. The anterior legs are well developed, all the parts being well proportioned to each other; the epiphysis of the fore tibia is inserted much nearer to the base and does not reach to the tip. The harpes narrow quite abruptly before the tip, then dilate, principally on the lower margin, before terminating in an obliquely rounded tip. The clasper is well developed, not very broad, the finger long and stout, a little excavated within, while there is a short angular process from the upper margin, which can hardly be called finger-like.

LARVA.

HARRIS, Ent. Corr., 1869, p. 312, pl. III, fig. 10.—THAXTER, Papilio, 1883, III, p. 13.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 272; Ibid., p. 273 (*ulmi*).

Eggs.—"Very small, much flattened, whitish." (Thaxter.)

Stage I.—"Dirty greenish white, without marks; a few white hairs; a subdorsal row, black; head tinged with brown" (Thaxter). Width of head, probably 0.3 mm.

Stage II.—Head whitish, not shining, no marks; width, 0.4 mm.; body pale green, with indications of a whitish subdorsal line; warts conic, with a long central seta and crown of short hairs, a few glandular tipped, part light, part dark, some of the small ones black; on joint 12 tubercles I and II form a square, IV with only one seta, VI present, the warts much in line transversely; leg plates a little yellowish, with several pale setae. Of the four setae on the cervical shield, only the posterior lower one is supplemented by short hairs and elongated into a wart, but there is a row of little hairs along the front edge of the shield. No secondary hairs on the body as yet.

Stage III.—Head, 0.7 mm; as before, brighter green; the pale, whitish subdorsal line more distinct, continuous; hair dark dorsally, pale subventrally. Later there is a pale brown dorsal shading on joints 2, 5, and 12.

Stage IV.—Head, whitish green, bilobed, the apices pointed; a small patch of brown mottlings in front, below the apex of each lobe; width, 1.2 mm. Body green, subdorsal line faint, yellowish; joints 5, 8, and 12 shaded dorsally with dark brown; hair long and white. There are a few short secondary hairs; but on the dark patches inclosed by tubercles I and II on joints 5, 8, and 12 they are more numerous, black, with enlarged ends; subventrally only a few, and these white. The longer dorsal primary hairs are black.

Stage V.—Head bilobed, pale green, covered over the apex of each lobe with a large patch of spots composed of brown and black dots on a pale whitish ground, the patch reaching to the ocelli; apices of lobes brown; ocelli black; width, 1.8 mm. Body green, a raised brown area dorsally on joints 5, 8, and 12, surrounded by a yellow ring, the one on 8 passing also on to 9. Warts small, bearing two to four short black hairs on I to III on abdomen; larger more numerous on warts IV to VI, IV small, behind the spiracle. Secondary hairs represented by minute pile, most distinct in the elevated dorsal patches. Tubercles on the edge of the cervical shield blackish, warts yellowish.

Stage VI.—As before, the dorsal patches darker, blackish brown, the yellow borders narrow and dull. Tubercles I and II surrounded by black. Width of head, 2.8 mm.

Stage VII.—Head large, held out flat, the sutures deep; black, shagreened, apices of lobes tipped with red; clypeus with sutures broadly greenish white; width, 4 to 4.5 mm. Body light olive gray, a lozenge-shaped dorsal enlargement on joints 5, 8, and 12, bearing tubercles I at the corners, darker than the body and bordered with black. A dorsal gray band, whitish centrally, enlarged on each segment to include tubercle II. Lateral region irregularly shaded with gray. A lateral brown band, defined by blackish marks stigmatally. Hair thin, white, very scant, almost absent dorsally, longer subventrally. Secondary hairs numerous, short, the dorsal ones flattened, the subventral ones long and normal. Warts normal, rather small, with few to several hairs, those on the sides whitish.

Cocoon.—"Spun under loose bark or in the crevices" (Thaxter); "tough" (Riley).

Food plants.—Elm, apple, linden.

ACRONYCTA OCCIDENTALIS Grote and Robinson.

(Plates II, fig. 8, adult; V, figs. 7, 8, larva; XX, fig. 8, male genitalia.)

Acronycta occidentalis Grote and Robinson, Proc. Ent. Soc. Phila., 1866, VI, p. 16.—Speyer, Stett. Ent. Zeit., 1875, XXXVI, p. 108.

Apatela occidentalis Grote, Ann. Lyc. Nat. Hist., N. Y., 1876, XI, p. 302; Papilio, 1883, III, p. 67.—Packard, Forest Insects, 1890, p. 167.

Hyboma occidentalis Grote, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Acronycta psi Guenée, Spec. Gen. Noct., 1852, I, p. 43.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 42.—Grote and Robinson, Proc. Ent. Soc. Phila., 1866, VI, p. 16, pr. syn.

Acronycta interrupta Guenée, Spec. Gen., Noct., 1852, I, p. 46.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 55.—Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 78.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 46.

Ground color ashen gray and quite even, sometimes with a faint yellowish shading. Head and thorax immaculate, except for the line extending from the sides of the palpi to the base of the wing. Primaries with the ordinary markings fairly well defined. The basal line is marked by geminate black lines on the costa. The transverse anterior line is geminate, black on the costa, becoming broken and less defined toward the inner margin, which is reached just a little within the middle. As a whole the line is even and outwardly oblique. The median shade is marked by an oblique blackish line from the costa to the reniform, of which it darkens the outer margin. The transverse posterior line is somewhat indistinctly geminate, the outer portion being narrow and black, a little lunulate, the inner portion being hardly distinct and principally evident by the somewhat paler included space. There is a very vaguely defined pale subterminal line, which is irregular in course and hardly traceable in most specimens. The basal dash is black and distinct, crossing to the outer portion of the transverse anterior line, and sometimes extending even a little beyond it. There is a black dash which crosses the transverse anterior line opposite the cell, and another which crosses it opposite the anal angle. This latter is much the heavier, and is usually accompanied by a dusky suffusion, which makes this part of the wing most prominent. The orbicular is round, black or brown ringed, fairly well defined. The reniform is kidney shaped, fairly well defined inwardly, and sometimes complete. It is a little marked with yellowish in some specimens. There is a series of black terminal dots, beyond which the fringes are cut with black on the interspaces. The secondaries are smoky in the female, distinctly paler and more whitish in the male. Beneath, powdery pale gray, with a quite obvious outer line and a more or less evident discal spot.

Expanse, 1.40 to 1.68 inches (35 to 42 mm.).

Habitat.—Ontario, Canada; Schenectady, New York, in July; Kendall, Rochester, and Long Island, New York; Maine; New Hampshire; Pennsylvania; Georgia; West Point, Nebraska, in June; Washington, District of Columbia, in May; New Jersey in June.

This is one of the most common species in this group, and probably extends throughout the Eastern United States. In fact, I have seen it from most of the States, although I do not at the present time have specimens before me. In my catalogue I have it recorded from Illinois in August, and in the Harris collection, Massachusetts, are specimens dated April 25, May 25, and June 1. It is recorded in Canada from May to August, and in New York to September. The species varies little and is quite easily distinguished. It differs from *morula* in its smaller size and by the lack of the yellow in the thorax and primaries. From *hasta* and its allies it differs by lacking a black connecting dash between the ordinary spots. There is little variation, except in the relative distinctness of the markings. The front is moderate, convex, but hardly bulging. The anterior legs of the male have the femur quite stout, the tibia and tarsi quite long, and slender in proportion. The epiphysis is attached above the middle and does not reach to the tip. The harpes of the male are a little narrowed just above the clasper, and widen slightly just before the rounded tip. The clasper is moderately developed, the finger quite strongly curved and not very long. There is the merest projection from the upper margin to indicate the presence of an additional process.

LARVA.

Guenée, Spec. Gen. Noct., 1852, I, p. 46 (*interrupta*).—Harris, Ent. Corr., 1869, p. 311 (*sagittaria*).—Saunders, Can. Ent., 1872, IV, p. 49 (*occidentalis*).—Marten, Trans. Dept. Agr. Ill., 1880, XVIII, p. 129.—Edwards and Elliot, Papilio, 1883, III, p. 132.—Saunders, Ins. Inj. Fruits, 1883, p. 165.—Dimmock, Psyche, 1885, IV, p. 274.—Packard, Fifth Rep. U. S. Ent. Comm., 1890, p. 167.

Stage III.—Head white, the lobes pointed; a black patch at the vertex, one on each side of the clypeus and one over the eye; width, 0.9 mm. Body white, warts I to III black, the rest pale, pointed conic, with a crown of hairs; all the body thickly covered with short secondary hairs enlarged at the tips. Tubercles I and II on joint 12 form a square. Dorsum broadly streaked with dark brown, cut by dorsal and subdorsal white lines. Hair black and white, even some of the secondary ones black. Warts normal, IV rather small, all nearly in a single transverse line.

Stage IV.—Head black, a geminate white spot at apex of clypeus and white streaks on the sides; apices of lobes pointed, pale brown; width, 1.4 mm. Body whitish as before; dorsal and subdorsal lines white, distinct; sides shaded with brownish, joint 13 pale. Secondary hairs short, club-shaped. Tubercles actually pale, but more or less closely ringed with dusky brown. Later a broad faint reddish patch covers tubercles I, II on joints of abdomen.

Stage V.—Head bilobed, black, dark red on the apices of the lobes; width, 2.5 mm. Body dull purplish, dorsal line pale, shading into reddish in the center of each segment around tubercles I and II; subdorsal space purple; subdorsal line white, bordered below with purple; a faint reddish stigmatal line. Warts black, I and II containing pale rings, joint 12 nearly all black dorsally. Thoracic feet and leg plates black. Hair black dorsally, white subventrally, the secondary ones much reduced, short, fine, black, not evident with a lens, pointed tipped, numerous, but long and white subventrally. Cervical shield black, tubercles pale.

Stage VI.—Head large, slightly bilobed; median suture deep before the vertex, but shallow behind; flat in front; blackish mahogany red, shining, darker below; clypeus black, with the sutures purplish; sides posteriorly mottled with pale; width, 3.5 to 3.8 mm. Body purplish or flesh color, of even width, joint 12 enlarged dorsally in a rounded quadrate elevation which bears tubercles I and II on the corners and pulsates centrally. Warts slight, consisting of an aggregation of three to ten piliferous tubercles with a slightly enlarged common base; IV rather small. Hair thin, long, reddish, with a few short, pale secondary ones subventrally, but the secondary coating in general nearly absent. The lilac color of the body shades into blackish subventrally. Dorsally a broad blackish band, marked with a series of black patches on joints 5 to 11, each throwing out a lateral spur which curves around wart II, and containing the pale tubercles I and two red spots situated in the dorsal line. Sometimes the red spots are connected into a single hourglass-shaped spot. The hump on joint 12 is uniformly black. Tubercle I shining blue-black at base; II in a small yellowish white patch. A faint lateral black line above tubercle III. Spiracles black with white center. Length, 25 mm.

Cocoon.—A thin web spun in the earth or "covered with a leaf." (Harris.)

Pupa.—Light brown, abdomen tapering, the segments rather coarsely but indistinctly punctured anteriorly; wing cases grooved and shagreened. Cremaster wide, short, ending in a transverse rim which bears three ridges below and about eight above, somewhat curved and irregular. Terminally three long spines, slightly hooked, on one side of the cremaster, on the other side nothing. Length, 14 mm. (only one specimen).

Food plants.—Elm, apple, sugar plum, beach plum, birch.

ACRONYCTA LOBELIAE Guenée.

(Plates II, fig. 11, adult; VII, fig. 24, larva; XVII, fig 22, leg; XX, figs. 10, 11, male genitalia.)

Acronycta lobeliae Guenée, Spec. Gen. Noct., 1852, I, p 41.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 51.

Apatela lobeliae Grote, Papilio, 1883, III, p. 68.—Packard, Forest Insects, 1890, p. 168.

Hyboma lobeliae Grote, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color whitish ashen gray, with a vague yellowish tinge throughout. Head and thorax without markings, save the usual black line from the palpi to the base of the wings, which extends a little on the thorax in this case, and is somewhat connected by a more or less evident line across the front of the head. The primaries have all the ordinary markings very distinct. Basal line geminate, well marked on the costa. Transverse anterior line geminate, well marked on costa, but more feeble beyond that point and in rare cases entirely wanting. As a whole it is quite even and outwardly oblique. The median line is marked on the costa by an oblique shade, which reaches to and a little darkens the center of the reniform. The transverse posterior line is lunulate, continuous, strongly outcurved over the cell and incurved beneath. The black lunule is preceded by a distinct whitish shade, which renders the line decidedly more prominent. The subterminal line is pale, more or less incomplete, not defined, and in some cases almost at the base of the fringes. There is a series of black terminal dots, beyond which the fringes are cut with black. In well-preserved specimens it is seen that the fringes are also interlined. The basal black streak is very heavy and prominent, extends clean across the transverse anterior line, and usually a little into the median space. In many specimens the internal vein is well marked with black through nearly the entire median space. There is a distinct dagger mark opposite the cell, which usually crosses the transverse posterior line, and there is another much heavier dash which crosses the line in the submedian interspace. The ordinary spots are well marked and of the ground color. The orbicular is round or nearly so, well defined inferiorly, but usually not complete above. The reniform is large, kidney shaped, well marked interiorly, but rarely complete outwardly. A distinct black line connects the two spots along the lower margin. Secondaries smoky, sometimes considerably paler in the male. Beneath whitish, powdery, the tips of the wings sometimes a little smoky; both wings with a more or less distinct outer line and discal spot.

Expanse, 1.80 to 2.40 inches (45 to 60 mm.).

Habitat.—From Canada to Florida and Texas, west to the Rocky Mountains. Texas, in March, April, and May; Illinois, April, May, and July 1; Washington, District of Columbia, in April; New Jersey, in June and August; Evans Center, New York, in June; Minnesota, in August; Douglas County, Kansas; Louisiana, in April.

This is as large as *morula*, and one of the most common species in this series. It is as a rule easily recognized by the large size and by the very prominent contrasting black dashes, which are better marked than in any other species. There is considerable variation in size and considerable variation also in the color of the hind wings, especially of the males. It has been impossible, however, for me to separate them into species on any tangible character, and I have been compelled to hold them together. Ordinarily the very heavy black markings, combined with the dark under wings and quite pale gray primaries, will be sufficient to recognize the species. The head is quite distinct, the front bulging and a little prominent. The legs are well developed, the femur being very stout at the base and somewhat abruptly narrowed toward the tip. The tibia has the epiphysis attached quite close to the base and not extending much beyond the middle. The harpes of the male are narrow, bluntly rounded at the tip, sometimes a little broader just before. The clasper is well developed, the superior process curved and moderately long, a distinct finger-like process of good length from the upper margin near the base of the clasper. The species is well represented in all the collections before me and a very large series of both sexes has been under examination.

LARVA.

GUENÉE, Spec. Gen., Noct., 1852, I, p. 44.—COQUILLETT, Papilio, 1881, I, p. 6.—PACKARD, Fifth Report U. S. Ent. Comm., 1890, p. 168.

Egg.—Circular, about 45- ribbed, of the shape of a segment of a sphere, flattened. Ribs free at ends, not diminishing in number till one-third the distance to apex, when the alternate ones terminate; the others end in a circular ridge around the micropyle, which is reticulated, highest in the center. Ridges wavy; the grooves between likewise waved; no cross striae Diameter, 1 mm.; height, 0.3 mm.

Stage I.—Whitish, a large purple-brown dorsal spot on joints 2, 4, 5, 8, 9, and a smaller one on 12 and anal plate, varying in distinctness. Head pale, with a similar spot on each lobe; width, 0.3 mm. Tubercles large in the dark marks, smaller elsewhere, and concolorous, normal, single haired, the hairs of I to IV black, V white, a small white seta on the leg plate. On thorax I*a*+I*b* dark, II*a* black, II*b* small and pale, as also IV and VI.

Stage II.—Head whitish, a brown spot above and two below on the face of each lobe; width, 0.4 mm. Body white, the dorsum dark purple-brown on joints 2, 4–5, 8–9, and 12, the spot on joint 2 double. Warts conic, with a crown of glandular-tipped hairs and central long seta, two setae on wart I; I to III black. Secondary hairs black in the dark spots, white on the white ground; hairs of wart VI pale, not glandular. Later the spots on the head become confluent behind, leaving the points of the lobes marked by white. The green food contrasts with dorsal patches on the pale segments.

Stage III.—Head, 0.8 mm.; white, with four brown-black spots in front and a streak on the neck. Brown dorsal patches on the body connected by a faint subdorsal line inclosing white patches on the pale segments, greenish in the incisures. Sides whitish. Warts as before, some glandular secondary hairs also arising from the skin.

Stage IV.—Head square, bilobed, apices reddish, ground whitish, four large black spots in front, and mottlings on the sides; width, 1.5 mm. Body whitish, dorsum above wart III all shaded with dark brown, heaviest on joints 2, 4–5, 8–9, and 12, the other segments yellow. A broken pale dorsal line. Hair black dorsally, white subventrally, the short secondary hairs on both the low conic warts and body glandular tipped and concolorous with the markings. Later the dorsum becomes more brownish, leaving, besides pale, broken dorsal and subdorsal line, yellow patches around wart I on joints 3, 6, 7, 10, 11, and 13.

Stage V.—Head large, bilobed, narrowing above; ground color white, thickly mottled with black patches, apices of lobes red; width, 2.2 mm. Body gray, dotted with black; a whitish dorsal and subdorsal line; tubercles I to III whitish, with two or three black hairs, IV very small, V and VI with abundant soft white hairs; I and II in a square on joint 12. A tiny black dot before tubercle I and a reddish shade between I and II.

Stage VI.—Head as before; width, 3.5 mm. Body gray, with very faint grayish-white dorsal and subdorsal lines. Hairs from small, nearly concolorous warts, I to III with a few black hairs, IV obscure; abundant fine whitish hair subventrally, mostly secondary. Skin above with fine black points. Small orange-yellow spots between tubercles I and II on joints 5 to 11. Spiracles black ringed. Later bluish gray, a yellowish-gray diamond-shaped patch on joints 5 to 12; those on joints 5 and 12 shaded with blackish. This marking only appears when the larva is full fed.

Stage VII.—No change whatever; width of head, 4.4 mm.

Stage VIII.—As before, till near the end of the stage, which lasts eleven days. Width of head, 5.7 mm. On leaving the plant the larva changes color. The head is large, scarcely bilobed, shagreened; black above, obscuring the red apices, a broad, shaded grayish-white band transversely, festooned up over the clypeus; clypeus gray; mouth black. Body appearing a little flattened, slaty gray, a greenish-white dorsal and subdorsal line and diffuse lateral and substigmatal patches.

Warts small, several haired; hairs short and black on tubercles I to III, white subventrally, both secondary and from tubercles V and VI. Dorsum thickly covered with black points. A diffuse yellow patch below warts I and II and around III. Joint 12 slightly enlarged dorsally. A few long black hairs at the extremities.

Cocoon.—Single, but firm and tough, composed of silk and bits of wood bitten off, a considerable portion formed by the supporting wood.

Pupa.—Brown, shining, gently tapering, the abdominal segments punctured all over, the punctures extending back to the finely shagreened incisures; wing cases grooved and transversely wrinkled. Cremaster short, subconic, with large longitudinal wrinkles. Upper hook one; lower, three on each side, regularly spaced; all large, with recurved tips.

Food plant—Oak.

ACRONYCTA FURCIFERA Guenée.

(Plates II, fig. 13, male; figs. 14, 15, female adult; VI, fig. 10, larva; XVIII, fig. 30, leg; XX, fig. 12, male genitalia.)

Acronycta furcifera GUENÉE, Spec. Gen., Noct., 1852, 1, p. 44.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 51.
Apatela furcifera GROTE, Papilio, 1883, III, p. 68.
Apatela lobeliae ‡ FRENCH, Can. Ent., 1886, XVIII, p. 118.

Ground color dark bluish ash gray, quite heavily powdered and with a somewhat smoky suffusion. Head and thorax without markings, except for the usual lateral line. Primaries with all the markings fairly well defined. Basal line geminate, smoky, sometimes extending to the basal dash. Transverse anterior line geminate, outwardly oblique, and quite even. It is usually a little better marked at the costa, but is traceable clear across the wing in all the thirty-odd specimens before me. The median shade is marked on the costa by a rather feeble oblique line, which crosses the reniform and is continued below it parallel with the transverse posterior line to the internal margin. This shade, while not distinct or prominent, is traceable in almost every specimen clear across the wing. The transverse posterior line is geminate, the inner line smoky and not well marked, the outer line black, lunulate, the intervening space paler than the ground color. As a whole the line is quite evenly bisinuate. The subterminal line is pale, very slightly marked in most of the specimens, but quite evident in some of the darkest forms. It is sometimes entirely obsolete. There is a series of black terminal dots at the base of the fringes, beyond which the latter are cut with black. The basal streak is broad and thick, extending to the outer portion of the transverse anterior line, but very rarely beyond it. There is a dagger mark opposite the cell which touches but rarely crosses the transverse posterior line. A similar mark in the submedian interspace usually crosses the transverse posterior line, and is much heavier than the other, without becoming as prominent as in *lobeliae.*

The ordinary spots are fairly well defined. The orbicular is small, a little irregular, sometimes oval, quite usually complete. The reniform is of moderate size, usually indefined outwardly. The two spots are connected inferiorly by a black line. Secondaries smoky white in the male, darker in the female. Beneath whitish, more or less powdered, with the usual outer line and discal spot.

Expanse, 1.50 to 1.80 inches (37 to 45 mm.).

Habitat.—Canada to Florida, west to Colorado; Kittery Point, Maine, in August; Carbondale, Illinois, in May; Union County, New Jersey, in July; Washington, District of Columbia, in August.

This is another common species with all the essential markings of *lobeliae*. It is much darker, however, distinctly smaller in size, and without the peculiar yellowish tinge. On the whole, the black markings are not so prominent as in the preceding species, but it is difficult to point out distinctive characters other than such as have already been noted. With a good series of specimens at hand there is rarely a doubt as to the species; but occasionally an intermediate example may be troublesome, unless reference is had of the male sexual characters. The head structure is essentially as in *lobeliae*. The leg is not quite so heavily built, and its heaviest point on the femur is nearer to the center. The tibial epiphysis is at about the middle and extends nearly to the tip. The harpes are long and narrow and somewhat acutely rounded at the tip. The clasper is rather slender, the superior processes being very long and well curved. There is a finger-like process from the upper margin, and this character will always separate this species from *lobeliae*. Between thirty and forty specimens have been under examination.

LARVA.

French, Can. Ent., 1886, XVIII, p. 118 (*lobeliae*).

Egg.—Round, very flat, the well-marked vertical grooves becoming obscure at the apex and less numerous. Transverse striae scarcely indicated. A slight rim at the base, where the egg is applied to the leaf. Colorless, whitish, not entirely transparent; diameter, 1 mm.; height, about 0.25 mm.

Stage I.—Translucent white, without marks. Head higher than wide, mouth pointed; width, 0.3 mm. Setae single, normal, long, curved, I and II dark, the rest pale and finer, subprimaries absent.

Stage II.—Head squarer than before, with pointed lobes, colorless; eye black; width, 0.5 mm. Body colorless, except for the food showing by transparency; a little opaquely whitish. Warts large, concolorous, each bearing a crown of short, pale setae besides the central dark one. Subventral setae all pale; IV small, situated on the white tracheal line, VI distinct, elongated longitudinally. A few setae on the leg plates. Later the body becomes pale green, with a broken white subdorsal line along tubercles II.

Stage III.—Head, about 1 mm. Body higher than wide, all pale green; a pale, broken, yellowish subdorsal line. Warts concolorous; hairs more numerous than before, more than one long one from each wart, pale, except some of the long dorsal ones. In another specimen a series of dorsal creamy white patches composed of a bar connecting tubercles I reaching back on the sides to II and again connected by a narrow line behind II. These are small on joints 3 and 4. large on 5 to 13, that on 12 with both transverse lines large.

Stage IV.—Head bilobed, whitish, faintly brown mottled on the upper part of the face; width, 1.8 mm. Body green, with a yellow subdorsal line between tubercles I and II, divergent on the thorax. Hairs few, black and white; warts concolorous, I and II forming a square on joint 12. A few fine secondary hairs laterally, seen under a half-inch objective. Later the dorsal space becomes faintly touched with brown on joints 2 to 12 between the yellow lines. In another specimen there were white dorsal patches as before, but red centered, the transverse bars broken by the red, the side parts fusing into the usual subdorsal line.

Stage V.—Head green, mottled with red brown on a white ground over the apex of the lobes and face; clypeus green; width, 2.5 mm. Body green, a red dorsal line on the narrow ridge-like dorsal space edged with yellow along warts II, reaching joint 13 and marked with blackish on the thorax and joint 12. Hairs thin, dark dorsally, white subventrally, and supplemented by secondary ones. Later the color of the head becomes yellowish; dorsal band brownish red, darker on joints 3 to 5, broken by yellow in the incisures, obsolete on joint 2, enlarged on 12 and reaching 13.

Stage VI.—Head bilobed, shining black, with a red patch at the apex of each lobe, slightly shagreened, the coarse setae pale; width, 3.7 mm. Body dull black, the warts (except I) pale brown, with central hair and tiny crown of reddish hairs, the brownish setae resembling the rather numerous secondary hairs. A dorsal bright red stripe on joints 3 to 11, narrowly edged with velvety black, broken broadly in the incisures. Joint 12 black on top, slightly elevated; feet pale.

Another larva had but five stages, with the following widths of head: .3, .5, 1, 2.2, 3.6 mm.

Cocoon.—"Spun up above ground, covered with small fragments of wood" (Riley).

Food plants.—Wild cherry, fire cherry, choke cherry.

ACRONYCTA HASTA Guenée.

(Plates I, fig. 14; IV, fig. 2, adult; XVIII, fig. 30, leg; XX, fig. 13, male genitalia.)

Acronycta hasta GUENÉE, Spec. Gen., Noct., 1852, I, p. 45.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 54.

Apatela hasta GROTE, Papilio, 1883, III, p. 67.

Acronycta telum GUENÉE, Spec. Gen., Noct., 1852, I, p. 45.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 54.

Apatela telum GROTE, Bull. U. S. Geol. Surv., 1883, VI, p. 571.

Ground color rather pale ash gray, mottled with smoky. Head and thorax with the usual lateral line. Primaries with all the markings fairly well defined. Basal line geminate, evident on the costa, and sometimes continued to the black dash. Transverse anterior line geminate, well marked throughout in most of the specimens, but occasionally becoming faint, especially in the female, and in some instances entirely wanting. The median shade is marked obliquely on the costa, and sometimes it is traceable below that point. Occasionally it may be followed for its entire course. Transverse posterior line geminate; but the inner line is very feebly if at all defined, and indicated by the paler included shade. The outer portion of the line is black, narrow, more or less lunulated, and as a whole the line is somewhat S-shaped. There is a fairly evident subterminal line, which is pale and irregular, varying much in distinctness. There is a series of black dots at the base of the fringes, which are cut with black beyond them. There is a heavy black basal dash, which extends to the transverse anterior line, and sometimes crosses it into the median space, though this is rare. A narrow black dagger mark, which tends to obolescence, is opposite the cell; a more prominent dash opposite the anal angle crosses the transverse posterior line in the submedian interspace. The ordinary spots are of the ground color or a little paler. The orbicular is irregular, somewhat oval. The reniform rather small, kidney-shaped, well marked inwardly, but usually vague outwardly. The spots are distinctly connected by a black line. Secondaries in the male whitish, with a faint smoky tinge; in the female smoky. Beneath white or nearly so, more or less black powdered, the primaries sometimes a little smoky, both wings with the usual outer line and dusky discal spot.

Expanse, 1.50 to 1.80 inches (37 to 45 mm.).

Habitat.—Canada in June; Maine to Washington, District of Columbia, west to the Mississippi; White Mountains, New Hampshire, in July; Ithaca, New York, June 17; Otto, New York, July 18; Delaware in March and May.

It is probable that the range of this species is greater than is indicated, but all my material is from the more northern portions of our country. The species is not uncommon in New Jersey, and seems to be not rare in Northern New York and New Hampshire. I have some thirty-odd specimens before me which show very little range of variation, except in size. On the whole, the species resemble *furcifera* quite closely, but the ground color is a much cleaner gray and the forewings are rather peculiarly mottled by smoky shadings, which are not so distinctly localized that they can be described. The markings contrast more than in *furcifera*, and finally, the secondaries in both sexes are much paler than in the previous species. In the male they are almost white; in the female they are not as dark as in the male of *furcifera*. In the character of the head this species agrees in general with *lobeliae*. In the leg structure the resemblance is on the whole to *furcifera*, though comparatively somewhat smaller. The harpes of the male are rather short, distinctly constricted before the tip, so that this seems enlarged and obliquely rounded. The clasper is stout, well developed, with the superior process long, strong, and well curved. There is no finger-like process from the superior margin.

ACRONYCTA LAETIFICA, new species.

(Plates III, fig. 12, adult; XVII, fig. 21, leg; XX, fig. 9, male genitalia.)

Ground color a creamy white, more or less black powdered. Head and thorax as usual, the disk sometimes faintly yellowish. Primaries with all the markings fairly evident. Basal line geminate, brown, marked on the costa and sometimes extending to the basal dash. Transverse anterior line geminate, oblique, more or less broken, black or brown, varying much in distinctness. On the whole, it is outwardly oblique. The median shade is black marked on the costa, extends obliquely to the reniform, and is sometimes traceable as a brown shade line parallel with the transverse posterior line to the inner margin. Transverse posterior line narrow, black, more or less lunulated, preceded by a white shade and followed by a blackish or smoky shading, which darkens the outer portion of the wing and relieves a paler subterminal line. The latter is more or less broken, not defined, and in pale specimens scarcely traceable. There is a line of black dots at the base of the fringes, beyond which they are cut with black. There is a distinct black basal dash, which usually extends only to the inner portion of the transverse anterior line, and in only one case, among the specimens before me, beyond the outer part of this line. There is a distinct black dagger mark, which crosses the transverse posterior line opposite the cell, and another that is much more prominent and accompanied by a dusky shade, which crosses it in the submedian interspace. The ordinary spots are well defined, of the ground color. The orbicular is is oval, irregular, black-ringed; the reniform quite small, well defined inwardly, and sometimes entirely complete. In most cases a black line unites the spots inferiorly, but this is sometimes wanting or very feebly defined. Secondaries smoky in both sexes, paler in the male, and with a yellowish tinge. Beneath white, powdery, with a more or less obvious irregular outer line, and on all wings a discal spot.

Expanse, 1.50 to 1.60 inches (37 to 40 mm.).

Habitat.—New York, New Jersey, Florida. There are no dates on any specimens.

This species has been confused with *furcifera*, with which it really has very little in common. The creamy white primaries are much nearer like those of *morula* or *occidentalis*, although paler and with a more silky luster than either. This will distinguish them quite readily from all other forms in which the ordinary spots are tied. In this species the connecting line between the ordinary spots tends to become obsolete, and in the specimens before me three have the connection entirely wanting. Such examples will be apt to fall with *occidentalis* in the table, especially as the latter species sometimes tends to have a slight connection between the ordinary spots. The present species, however, is larger, the wings are comparatively a little broader and square, the ground color is different, and the primaries are not so even as in *occidentalis*. This latter species also tends to lose the orbicular, which is always distinct in the new form, and finally the very dark smoky secondaries in this species give it an altogether different appearance. The head structure is like that of *lobeliae* in all essential features. The legs resemble those of *furcifera*, but the femur is comparatively a little shorter and stouter. The harpes of the male are long, slender, and just a little enlarged before the tip. The clasper is stout, the superior process moderately curved and quite heavy. There is no finger-like process from the upper margin. Types are in the collections of the U. S. National Museum. Cornell University, Rutgers College, and Messrs. Graef and Doll.

ACRONYCTA MANITOBA, new species.

(Plates XII, fig. 1, female adult; XVII, fig. 24, leg; XX, fig. 14, male genitalia.)

Ground color a dark bluish ash gray and very powdery. Head and thorax with the usual lateral line, which extends to the ends of the patagiae in this case. Primaries with all the ordinary markings traceable. Basal line geminate, blackish. Transverse anterior line geminate, blackish, outwardly oblique. Median shade extending obliquely from the costa over the reniform, and then parallel with the transverse posterior line, and, vaguely defined, to the inner margin. Transverse posterior line geminate, the inner line smoky, the included space white, the outer line narrowly black and a little lunulated. As a whole, bisinuate. There is an irregular, indefined, pale subterminal line. There is a series of black dots at the base of the fringes, beyond which the latter are cut with dusky, and there is also a series of blackish rays, which extend inwardly from these terminal dots. The black basal dash is heavy and reaches the outer portion of the transverse anterior line. There is an obvious black dagger mark which crosses the transverse posterior line opposite the cell, and another heavy mark of the same character in the submedian interspace. Orbicular round, of good size, black ringed, white centered. Reniform moderate in size, kidney shaped, more or less obscured by the median shade. These spots are inferiorly tied by a heavy black mark. Secondaries in the male pure white, a little soiled outwardly toward the tip; beneath smooth, only a little powdery, with a vaguely indicated exterior line and a better marked discal spot.

Expanse, 1.60 to 1.70 inches (40 to 42 mm.).

Habitat.—Winnipeg, Manitoba (Hanham); Glenwood Springs, Colorado, July 16 (Barnes).

I have two males of this species, one of them a perfect specimen, through the kindness of Mr. Hanham; the other an electric-light capture and a little rubbed, from Dr. Barnes. The species is very distinct and differs from anything else in the series. It is the only one with the ordinary spots tied that has pure white secondaries. The peculiar clear ashen-gray color with the dense powderings will also serve to make the species recognizable. In frontal structure it resembles *lobeliae*. The anterior femur of the male is quite heavy and short, the thickest part central. The tibia has the epiphysis attached above the middle and extending nearly to the tip. The harpes of the male are quite broad and very slightly dilated before the tip. The clasper is stout and well developed, the superior process moderately curved.

ACRONYCTA THORACICA Grote.

(Plates III, fig. 8, adult; XX, fig. 15, male genitalia.)

Apatela thoracica GROTE, North Am. Ent., 1880, I, p. 94; Papilio, 1883, III, p. 68.

Ground color bluish ash gray, a little mottled with yellowish shadings. Head and thorax well powdered. Head with the front black marked, the thorax with the disk yellow. Primaries with the transverse lines tending to become imperfect, while the veins are so emphasized as to give the species a somewhat strigate character. The basal line geminate on the costa. Transverse anterior line geminate on the costa, but beyond that vague and in none of my specimens traceable across the wing. On the costa the line is blackish; beyond that point it has a yellowish tinge. The median shade is marked obliquely and quite prominently on the costa, and extends between the ordinary spots. Transverse posterior line widely outcurved, lunulate, narrow, blackish, followed outwardly by a yellowish dusky shading which merges into the ground color before the outer margin. There is a series of black terminal dots, beyond which the fringes are cut with blackish, and from which rays are sent inwardly in the interspaces. There is no subterminal line. The basal black line is distinct, extending through the transverse anterior line and into the median space, in one case nearly meeting the well-marked black dash which crosses the transverse posterior line in the submedian interspace. There is a distinct dagger mark crossing the transverse posterior line opposite the cell. At the extreme base of the wing inferiorly there is a patch of yellow scales. The ordinary spots are incompletely defined. The orbicular is oval, a little paler than the ground color, incompletely ringed with blackish. The reniform is well marked inwardly, kidney shaped, marked with yellowish. There is a distinct connecting line between the ordinary spots, and the narrow space between them is filled by an extension of the median shade. Secondaries whitish; in the female with a feebly developed outer line. Beneath white somewhat powdery, with a more or less complete outer line and discal spot.

Expanse, 1.60 to 1.70 inches (40 to 43 mm.).

Habitat.—Tucson, Arizona; near Hot Springs, Las Vegas, New Mexico, 7,000 feet, July.

This species is easily distinguishable. The distinct yellow disk of the thorax, the yellowish patch at the extreme base of the wings and in the reniform, and the general yellowish tinge beyond the transverse posterior line are all characteristic.

ACRONYCTA STRIGULATA, new species.

(Plates XII, fig. 6, female adult; XVIII, fig. 26, leg; XX, fig. 16, male genitalia.)

Ground color an even bluish ash gray, very finely powdered. Head and thorax of the ground color; thorax with the disk smoky, but with a yellowish tinge in the male. Primaries with the transverse maculation more or less obsolete, and veins, being more or less white, give the wing a longitudinally strigate appearance. Basal line wanting in the specimens before me. Transverse anterior line marked on the costa by a pair of smoky lines, which are not traceable beyond their inception. The median shade is indicated by an oblique smoky streak. The transverse posterior line is very slender, blackish, lunulate, and best marked in the submedian interspace. There is a series of black terminal dots, beyond which the fringes are cut with black, and from which rays are sent inwardly. Three of these rays just below the apex are quite prominent, the third of them forming a dagger mark which reaches to and extends a little beyond the transverse posterior line. In the submedian interspace there are two of these rays, the upper of which is shaded and connected by a smoky shade with the lower, which forms a little dash and extends across the transverse posterior line at this point, nearly meeting the long basal dash, which in this case is superiorly margined by the median vein. The ordinary spots are very indefinite. The orbicular is usually white or nearly so, but is not well margined and may be entirely obsolete. The reniform is of moderate size, kidney shaped, and only marked inferiorly. There is a curved black streak which indicates a connecting line between the ordinary spots, and to this point the oblique shade from the costa extends. Secondaries white, with the fringes a little dusky at base. Beneath white, with a more or less well-marked outer line and discal spot.

Expanse, 1.36 to 1.55 inches (34 to 39 mm.).

Habitat.—Colorado (Bruce); Glenwood Springs in July (Dr. Barnes).

I have three males and two females before me which do not vary, except in size, and that very slightly. The species is smaller than *thoracica* and is an intensification of the characters found in that species. The practical absence of all the transverse maculation, the small size, and peculiar blue color of the primaries will serve to identify this form. The head is convex without being prominent, the femur is well developed, the tibia rather slight, the epiphysis attached very close to the base, but extending almost to the tip. The harpes of the male are broad and rather short, somewhat dilated and oblique near their termination. The clasper is very stout, the superior process not very long, unusually broad, and only a little curved, the finger-like process from the upper margin longer and well developed, almost straight.

ACRONYCTA VINNULA Grote.

(Plates IV, fig. 11, adult; XVII, fig. 23, leg; XXI, fig. 9, male genitalia.)

Microcoelia vinnula GROTE, Proc. Ent. Soc. Phila., 1864, II, p. 436, pl. IX, fig. 2.
Acronycta vinnula GROTE, Trans. Am. Ent. Soc., 1868, II, p. 118.
Apatela vinnula GROTE, Papilio, 1883, III, p. 68.

Ground color milky white, more or less suffused with greenish or luteous mottlings. The disk of the thorax is quite usually dark, and sometimes the tip of the collar is almost blackish. The patagiae at the sides are also black marked. The primaries have all the ordinary markings distinct, but very variably evident. The basal line is geminate and marked on the costa, sometimes black, sometimes greenish gray, or of an intermediate shade. The transverse anterior line is also geminate, outwardly oblique, more or less toothed on the veins, yet as a whole quite even in course. It may be black or greenish gray, or the inner line may be black and the outer green, or parts of both may be of either color. There is a distinct median shade running obliquely from the costa across the reniform and thence with an almost right angle to the inner margin. The line may be entirely greenish, or the part from the costa to the reniform may be black. The transverse posterior line is indistinctly geminate, the outer line black and distinct, a little lunulated, but as a whole with a very even outcurve over the cell. The inner line is well marked on the costa, but in most cases is very vague beyond that point. The intermediate space is often white marked and quite prominent, though sometimes of the usual ground color. The subterminal space is greenish and vaguely defines an irregular subterminal line by its contrast with the terminal space. There is a series of black terminal dots, beyond which the wings are cut with blackish. There is a more or less distinct black mark between veins 5 and 6, extending from the margin inwardly and sometimes reaching the transverse posterior line. There is a black dash opposite the anal angle, which reaches to but does not cross the transverse posterior line, and which is more or less shaded with black and green. There is a distinct basal black streak, which is almost broken in the middle. The orbicular is round, or nearly so, completely defined in either black or greenish. The reniform is moderate in size, well defined in most instances, and crescent rather than kidney shaped. The secondaries are dirty whitish in the male, dark in the female. Beneath whitish, with the disk of the primaries mostly smoky; secondaries with a distinct discal dot, and both wings with an outer line, which is much more defined on the secondaries.

Expanse, 1.20 to 1.30 inches (30 to 32 mm.).

Habitat.—Canada to Texas, west to the Mississippi Valley; New Jersey in June; Albany, New York, in May and June; Evans Center, New York, July; Long Island, New York, August; central Missouri in July; Texas in May, June, and July.

This pretty little species is quite easily recognizable and is unlike anything else in the genus. The primaries have a peculiarly smooth, almost metallic, vestiture, on which the greenish mottlings are well defined. It varies quite considerably in the amount of contrast between the ground color and the markings, and it easily fades in the cabinet, so that fresh specimens are often quite different at first sight from those that have been kept in the collection. The front is flat, or bulges but little; the palpi are well developed and extend easily to the middle of the front. The legs of the male are normally developed, all the parts proportionate, and none of them particularly heavy. The epiphysis of the tibia is attached nearer to the base than to the middle, but extends almost to the tip. The tarsi are perhaps longer in proportion to the rest of the leg than is usual. The harpes are rather short, even, rounded at tip. The clasper is very stout and strong, forming a single beak-like structure, the edges of which are irregular and toothed. They are therefore quite distinctive and unlike anything else found in the genus. Altogether, this is a very well marked form in all its features.

LARVA.

Stage VI.—Head bilobed, rounded, a pulverulent brown patch on the upper part of the face of each lobe, reaching to the median suture. Clypeus high as usual, but the side pieces indistinct and fused with the lobes, so that only the triangular center is distinct; width, 2.8 mm. Body higher than wide, thorax thicker than the head, joint 12 scarcely enlarged. Tubercule II on joints 5 and 12 produced, prominent, all the others greatly reduced, small, and obscure, except the thoracic ones, which are moderate. Body green, a narrow subdorsal band bent up to tubercule II on joints 5 and 12, elsewhere reaching somewhat below it. A faint, straight, pale dorsal, and substigmatal lines. Prominent tubercles brownish. Warts with a central seta and crown of short ones, dark from warts I to III, pale IV to VI, with some fine, short, pale, secondary hairs subventrally. Length, 24 mm.

Food plant.—Elm.

ACRONYCTA FRAGILIS Guenée.

(Plates XII, fig. 3, female adult; XXI, fig. 7, male genitalia.)

Microcoelia fragilis Guenée, Spec. Gen., Noct., 1852, I, p. 34.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 31.—Grote, Proc. Ent. Soc. Phila., 1864, III, p. 80.—Morrison, Psyche, 1875, I, p. 42.

Bryophila spectans Walker, Can. Nat. and Geol., 1861, VI, p. 38 —Grote, Can. Ent., 1877, IX, p. 27, pr. syn.

Ground color whitish, almost completely overlaid by smoky brown scales. The head is black spotted; the collar is black marked on the disk, tipped with white. The disk of the thorax is marked with smoky black, and the patagiae are black edged. The primaries with all the ordinary maculation distinct. Transverse anterior line geminate, black, the included space white; the lower part of the basal space is much darker than the upper, where the smoky scales overlying the white base are rather sparse. The transverse anterior line is geminate, black, toothed on the veins, the two parts equally distinct, the intervening space white. As a whole, its course is a little oblique outwardly. Most of the veins through the median spaces are white marked, and on the internal margin is a black mark which does not quite cross the median space. The median shade line is marked on the costa, running obliquely to the reniform and then very close to the transverse posterior line to the internal margin. It is not well marked, but a little darker than the smoky suffusion of the wing. The transverse posterior line is geminate, the outer line black, distinct, lunulate, strongly dentate on the veins; the inner blackish and best defined by the white included space. Beyond the transverse posterior line the wing is nearly black, relieved by a dentate white subterminal line. There is a white line at the base of the fringes, which are black, or nearly so, and cut with white lines. The basal dash is merged into the general dark shading of the lower part of the basal space. The orbicular is rounded, or nearly so, black ringed and white centered. The reniform is of moderate size, kidney shaped, black ringed, and centered with the smoky ground. Secondaries yellowish white in both sexes; in some specimens with an obvious outer darker line. There is a broken terminal line, and the fringes are more or less evidently cut with blackish. Beneath, both wings are yellowish white, powdery, with a more or less obvious outer line and discal spot.

Expanse, 1.20 to 1.35 inches (30 to 33 mm.).

Habitat.—Canada to New Jersey, west to the Mississippi; Canada in June and July; Manchester, Vermont, August 3; Lancaster, New York, August.

This species is quite different from anything else in the genus, and has been heretofore associated with *diphtheroides* under the generic term *Microcoelia*. In all structural characters it agrees with *Acronycta*, and I can not see any reason, except that the markings are a little different, for removing it from the present genus. It is well associated with the species with which it is here placed, and the sexual characters justify the reference, though they are unique, and remind one rather of *tritona*, or even *funeralis*. The harpes are broad, somewhat oblique inferiorly, and pointed at the tip. The clasper is very strong, the inferior plate produced into a curved hook at the lower margin, while from behind the middle of the upper margin there arises a very long, stout, curved, hook-like process which can best be compared to that in *funeralis*. The front is round, but hardly bulging, and the leg structure is normal, not differing greatly from the species with which this is associated.

LARVA.

Egg.—Much flattened, round, with a rim-like margin; ribs distinct, some confluent as they diminish in number toward the vertex, wavy, about sixty on the edge; micropyle irregularly ridged; cross lines just perceptible in certain lights; shell colorless, white; diameter, 0.7 mm.

Stage I.—Body glassy, colorless; food green. Tubercles colorless, normal, I to V present, VI absent, I and II in a square on joint 12. Setae single, long, pale. Leg plates concolorous, with three setae. Width of head, 0.3 mm.

Stage II.—Width of head, 0.4 mm. Colorless; food green; faint white spots along warts II. Warts normal, VI present, rather elevated, each with a seta and crown of shorter ones. Hair pale, some dark ones dorsally.

Stage III.—Whitish; food green: width of head, 0.6 mm. A row of white subdorsal spots along warts II, all as before.

Stage IV.—Green, warts II broadly white; head whitish; width, about 1 mm. (calculated, 0.86 mm.), bilobed. Hair black and white, very long. Warts conic, with a crown of soft hairs.

Stage V.—As before, darker green, but still pale. White patches over warts I and II distinct, somewhat oblique. Hair long, dark dorsally; some scattered pale secondary ones on the body, most numerous subventrally. Width of head, 1.2 mm.; wart IV small. In male larvae the sex glands show plainly in joint 9, whitish.

Stage VI.—Head bilobed, rounded, green, with pale setae; no angles nor tubercles; width, 1.8 mm. Body thick, round, joint 12 a little enlarged, segmental incisures all well marked. Warts small, with fine hairs, normal, IV very small. Hair long, black from warts I to III, shorter and white from V and VI. Body green; a broad yellow subdorsal line, covering warts II, broken in the incisures. Toward the end of the stage the dorsal space is dotted with purple brown along warts I, but not continuously.

Stage VII.—Head slightly bilobed, green, a reddish-brown shade over the vertex of each lobe; ocelli and jaws dark; width, 2.4 to 2.6 mm. Body elevated at joints 4 to 7 in position of rest, head held down, joint 12 a little enlarged dorsally. Hairs few, black from warts I to III, the rest pale, with a few short, fine, dark secondary ones. Green; a narrow, broken, yellowish-white subdorsal line along warts II; wart I shaded with purplish brown in the area just around it, especially on joint 12, but all the shading rather faint. Spiracles dark brown, small. The dorsal shading may be more extensive, suggesting the filling in of the dorsal space, but not complete.

Food plants.—Birch, mountain ash, apple.

[NOTE.—*Acronycta minella* DYAR (*Apatela minella* DYAR, Journ. N. Y. Ent. Soc., 1898, VI, p. 41) was published too late for full treatment here.]

ACRONYCTA PAUPERCULA Grote.

(Plates XII, fig. 2, male adult; XVIII, fig. 29, leg; XXI, fig. 8, male genitalia.)

Apatela paupercula GROTE, Proc. Ac. Nat. Sci. Phila., 1874, p. 197.—HARVEY, Bull. Buff. Soc. Nat. Sci., 1875, III, p. 4.—GROTE, Papilio, 1883, III, p. 68.

Ground color whitish, with an indefined reddish-luteous suffusion, the disk of the thorax sometimes marked with this suffusing color. The lateral edges of the patagiae are sometimes black. The primaries with most of the markings fairly evident; but the transverse anterior line much less defined than the others. Basal line marked on the costa by a black line, which is sometimes wanting or replaced by a pair of luteous marks. Transverse anterior line geminate, as a whole evenly oblique, but more or less irregular on the veins. It is not complete in any of the specimens before me, but is usually well marked on the costa, and the inner line at least is marked a little below its junction with the basal streak. The median shade is marked by an oblique line from the costa across the reniform and from that point it is usually obsolete, though sometimes traceable to the inner margin. On the costa it is blackish shaded; beyond that it is vaguely luteous. The transverse posterior line is feebly geminate, the outer portion narrow, black, more or less lunulated. The inner line is mostly defined by a difference between the white included shade and the ground color of the wing. The subterminal space is irregular and variably darker, so that in some specimens no subterminal line is traceable. There is a series of black terminal dots, beyond which the fringes are cut with black. There is sometimes a narrow black streak from the transverse posterior line to the outer margin opposite the cell; but this is never prominent and in most instances altogether absent. The dagger mark in the submedian interspace is distinct, and except in rare instances crosses the transverse posterior line. There is an evident black basal streak which is almost broken at its middle and evidently made up of two portions. The orbicular is narrowly oblique, completely ringed by blackish or luteous. The reniform is well marked on the inside, but often somewhat vague outwardly. It is crescent rather than kidney shaped. The two spots are unusually close to each other and often touch. Secondaries in the male whitish, in the female a little darker. In both cases soiled outwardly. On the under side powdery, whitish, the primaries inclined to be smoky. Secondaries with a distinct discal spot; both wings with an outer dark line, which is much more evident on the secondaries.

Expanse, 1 to 1.25 inches (25 to 31 mm.).

Habitat.—Texas, February, March, June, and July.

This species most nearly resembles *vinnula*, but it has a different ground color and differs in details of maculation. It is very difficult to describe the color difference, because it is a matter of shading and tinting; but there is no greenish in this species, that shade being replaced by a peculiar dirty reddish luteous. In this species the transverse anterior line is much less evident, and the ordinary spots are very close together. The median shade line, which is a distinct and constant character in *vinnula*, is scarcely traceable in a few specimens of this species, while the dagger mark in the submedian interspace crosses the transverse posterior line in all my specimens. The front is slightly bulging, but not prominent. The palpi are fairly well developed and reach the middle of the front. The anterior legs of the male are rather short and stout, the tibiae particularly being stout, the epiphysis inserted just a little above the middle and not reaching to the tip. The tarsi are short in proportion to the rest of the leg, and altogether this is a stouter built limb than occurs in *vinnula*. The harpes of the male are moderate in length and quite broad, the tip being oblique. The clasper is small and somewhat hook-like, ending in a somewhat longer point. Eighteen specimens, representing both sexes, have been under examination.

ACRONYCTA LITHOSPILA Grote.

(Plates I, fig. 13, adult; XVI, fig. 10, venation; XXI, fig. 2, male genitalia.)

Acronycta lithospila GROTE, Proc. Bost. Soc. Nat. Hist., 1874, XVI, p. 240.
Hyboma lithospila GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color a very dark bluish gray, with a more or less evident smoky suffusion. Center of the collar and the disc of the thorax smoky. Primaries with all the transverse markings obscure and more or less obsolete. The veins are more or less black marked, and the dusky shadings are longitudinal in their general character, leaving the spaces below the middle of the wing slightly paler than elsewhere. All of these characters give a strigate appearance. The basal line is marked by an oblique streak on the costa. The transverse anterior line is marked in the same way, and nothing is to be seen of it below that point. The median shade is also marked by a smoky streak obliquely across the costa. The transverse posterior line is traceable across the wing and it is broken, narrow, formed of lunules or dots, which are sometimes only a little defined. There is a series of black terminal dots from which blackish rays extend inward in the interspaces. The fringes are interlined with dusky. There is a very slender longitudinal black line at base which reaches near to the middle of the wing, and sometimes almost connects with another black line which represents the ordinary dagger mark opposite the anal angle. A more or less evident black line crossing the transverse posterior line opposite the cell represents the dagger mark usually found in that position. The ordinary spots are scarcely traceable in most specimens. When best marked the orbicular is very small, faintly outlined by black scales, and a trifle lighter than the ground color. The reniform is an indefined, kidney-shaped spot, which is a little brown shaded. The secondaries are whitish, with a faint yellowish tinge in the female; in both sexes a little dusky outwardly. Beneath whitish, with the usual outer line and discal spot.

Expanse, 1.25 to 1.46 inches (33 to 37 mm.).

Habitat.—Canada to Florida, west to the Pacific coast; Mississippi; Colorado; Portland, Oregon, in May; Central New York in May; Georgia in April; Massachusetts in June.

This species is easily recognized by its very dark colors, the almost total absence of the transverse markings, and the narrowly strigate character of the ornamentation as a whole. The wings seem to be almost subequal and are only a little oblique on the outer margin, so that the creature seems narrower winged than its immediate allies. The front is convex and a little protuberant. The palpi are well developed, are free from the front and reach to fully its middle. The harpes of the male are slender, rounded at tip. The clasper is distinct, stout. The upper process is heavy, only a little curved, and of moderate length. The finger-like process from the upper margin is slender and almost straight. Twenty specimens of both sexes have been under examination.

LARVA.

Edwards and Elliot, Papilio, 1883, III, p. 132.

Egg.—Flattened, like two-thirds of a sphere, with about forty-eight ribs, diminishing in number above, not confluent; smooth, a wavy line on the apex and in the hollows. Micropyle finely reticulate.

Stage I.—Whitish, translucent; the food green. Purplish dorsal patches on joints 5, 8, 9, and faint on 12. Dorsal setae, I–III, black, lateral, IV–V, white, all single, no subprimaries, skin smooth. Head, 0.3 mm. wide.

Stage II.—Head whitish; width, 0.45 mm.; slight brown streaks in the angle of the lobe. Body nearly colorless, green from the food, a purplish-brown patch covering warts I and II on joints 5, 8, 9, and 12 and trace of a white subdorsal line in dashes over warts I and II on the pale segments. Dorsal hairs blackish, lateral pale. Warts with long setae, two from wart I, and clusters of short secondary hairs with slightly bulbous tips, concolorous with the marks. Later a white subdorsal line is more distinct, shaped in outline of the markings of the mature larva.

Stage III.—Head, 0.8 mm. wide, bilobed, the lobes pointed; whitish, with a brown shade below the apex of each; shining. Body green from the food, otherwise nearly colorless; a white subdorsal line touching each segment, most distinct on joints 7–10, where it borders a faint brown patch dorsally on joints 8 and 9. A slight tint of brown also on joints 5 and 12. Hairs long and dark, sparse, with many slender, short, finely bulbous-tipped pale ones spreading slightly on the skin as secondary hairs, only a few dark even in the dark marks.

Stage IV.—Much as in the next stage, the marks fainter; dorsal band mostly yellow, dark in the darkest part, the pattern recognizable; width of head, 1.2 mm.

Stage V.—Head bilobed, green, yellowish above, the apices of the lobes dotted with dark brown, running down on the outer angle; width, about 2 mm. Body humped up at joints 4–5 and 12, a little angularly enlarged. Sides green, a dark-brown dorsal band, edged with yellow, on joints 3 to 13, slightly widened on joint 5, but not reaching wart II till joints 8–12, where it widens to between warts II and III, gradually contracting till it just covers II on 12; narrowly continued to the end of the body. On joints 8 and 9 it is shaded with black centrally, no green inclosed patch, but a faint paler, scarcely whitish dorsal line. Warts small, several haired. Hairs blackish dorsally, pale subventrally, with a few secondary ones. Some minute brownish pile dorsally.

Stage VI.—Head bilobed, narrowing to the vertex, green, the apices of the lobes dark chocolate brown, spotted down the face; width, about 3 mm. Joint 12 with a sharp hump, warts I and II in a square. Markings as before throughout.

Stage VII.—Head green, the apices of the lobes narrowly sordid purplish brown, shining, a few black dots; the color shades down the angles in mottled spots on a yellowish ground, reaching about halfway to the ocelli; width, 4.2 mm. Body clear green, a little whitish frosted down the sides. Dorsal band on joints 3 to 13, chocolate brown, slightly milky, very narrowly yellow edged. It is widened on joint 3 centrally where it begins sharply; cervical shield all green; the band passes inside tubercle I on joint 4, just covers I by a slight expansion on joints 5 to 7, then widens between II and III on joints 8 to 10, just over II on 11, and narrows further to the square top of joint 12; still narrower to the end of joint 13; end of anal plate green. Joints 8 and 9, especially the warts, slightly shaded with blackish. Spiracles white with black rim. Hair quite long, but very fine and sparse, black from I to III, the rest whitish, as also a few secondary hairs subventrally. A number of small whitish dots on the sides. Skin minutely spinulose.

Food plants.—Hickory, oak, chestnut.

ACRONYCTA MANSUETA, new species.

(Plates XII, fig. 7, male adult; XXI, fig. 13, male genitalia.)

Ground color a bright bluish gray, very smooth and even. Head more or less marked with brown, not forming distinct lines. Collar also mottled with brown, forming an indefinite band at the base and another one near to the tip, the edge being marked by lighter scales. The disk of the thorax is sometimes a little darker, but more usually of the ground color. The patagiae are marked with black at the base of the wing. Primaries with the ordinary maculation fairly evident, but not very strongly marked. The basal line is feebly indicated on the costa, sometimes single, sometimes geminate, but always one line much stronger than the other if both are present. The transverse anterior line is geminate, brown, a little outcurved from the costa to the submedian interspace, where it becomes lost in the dark shading of the wing. The median shade is marked on the costa and extends outward sufficiently to darken the space between the ordinary spots. The transverse posterior line is distinct, squarely outcurved over the cell, and with a deep inward curve in the submedian interspace. It is geminate, the outer line lunulate and black, but fine, the inner line brown, slender, frequently defined only by the fact that the included space is paler. The space beyond the transverse posterior line is a little brown shaded, and the terminal space is more evenly dark, relieving a diffuse, whitish, irregular subterminal line. There is a slender black terminal line and a series of small terminal dots, beyond which the interlined fringes are cut with blackish. There is a black basal streak which extends to the transverse anterior line and below this the wing is shaded with blackish brown or smoky. Beyond the transverse anterior line this shade extends nearly to the transverse posterior line, being best marked on each side of the internal vein, where there is a black streak extending nearly across the median space. An arrow-shaped mark extends from the outer margin, just above the anal angle, inwardly to the transverse posterior line, which it barely crosses. The ordinary spots are fairly evident but not prominent, a little lighter than the ground color, very narrowly ringed. The orbicular is almost round and varies in size. The reniform is kidney-shaped and has a slightly yellowish shade, which is also somewhat marked at the base of the wing. In some specimens the shading just outside of the transverse posterior line is brownish. Secondaries pure white in the male, with a smoky line at the base of the fringes; in the female the outer margin is a little dusky. Wings beneath white, very slightly powdery, with hardly traceable outer lines and discal dots.

Expanse, 1.20 to 1.40 inches (30 to 35 mm.).

Habitat.—Los Angeles, Nevada County, and Sierra Nevada, California; eastern Washington; Garfield County, Colorado, 7,000 feet (Bruce); Glenwood Springs, Colorado, May and September (Barnes).

I have seen 10 specimens of this species, evenly divided as to sex, and very little difference indeed between them. The species is very easily distinguished by the dark shading along the internal margin, resembling in this particular *funeralis*, but differing from it in the more arched costa, the less curved outer margin, and in the fact that the black shading does not send up spurs along the interior part of the transverse anterior line. There is very little variation in the species so far as it is represented in the series before me. The size of the orbicular varies somewhat; there is a little change in the depth of the ground color, and in some specimens a dull ochery tinge is evident. The head seems small, the front flat, the palpi well developed and reaching to the middle of the front. The harpes of the male are oblong, a little curved, evenly rounded at the tip. The clasper is well developed, beak-like at the tip, and distinctly curved and twisted. There is a superior pointed process from the middle of the upper margin, which is of moderate length.

ACRONYCTA FUNERALIS Grote and Robinson.

(Plates III, fig. 7, adult; XVIII, fig. 27, leg; XXI, fig. 5, male genitalia.)

Acronycta funeralis Grote and Robinson, Proc. Ent. Soc. Phila., 1866, VI, p. 17, pl. III, fig. 8.—Grote and Robinson, Trans. Am. Ent. Soc., 1870, III, p. 179.—Speyer, Stett. Ent. Zeit., 1875, XXXVI, p. 200.

Apatela funeralis Grote, Check List Noct., 1875, pl. I, fig. 1; Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 11.

Jochearea funeralis Grote, Papilio, 1883, III, p. 111.

Acronycta americana ‡ Harris, Ent. Corresp., 1869, pl. III, fig. 3 (larva only).—Lintner, Ent. Cont., 1874, III, p. 157, pr. syn.

Ground color chalky white, more or less overlaid by gray scales, so that in some cases the wing really seems evenly gray with a little bluish shading. The head and thorax share in the differences in ground color, and vary all the way from almost white, to nearly black in the darkest specimen. In all cases a few dusky scales are intermixed which are most prominent along the sides where there is a distinct line extending from the palpi to the base of the wings along the patagiae. The primaries have the ordinary markings all traceable; but none of them well defined and the wing looks blotchy. The basal line is black, single and marked on the costa only. The transverse anterior line is usually single, marked by an oblique black dash on the costa, and sometimes traceable as a geminate brown line to the longitudinal black dash. A small portion of this line is visible in the shape of an upward spur from the black basal streak. The median shade forms a black or blackish blotch on the costa, darkening the upper portion of the space between the ordinary spots. The transverse posterior line is squarely bent outward over the cell, moderately incurved below, geminate on the costa and below the median vein. The outer line is narrow, black, irregular, not lunulated, the included space of the palest ground color. The inner portion of the line is dark shaded in the submedian interspace. Beyond the transverse posterior line the wing is quite uniformly bluish gray, through which an irregular, pale, diffuse subterminal line is traceable. There is a series of black marks at the base of the fringes, beyond which the latter are cut with black. There is a broad black streak at the base, extending through the transverse anterior line nearly to the transverse posterior line and in some cases touching it, and below this the wing is black or very dark smoky. From the outer margin just above the anal angle a broad black streak extends inward, crossing the transverse posterior line and joining with the black shade beyond it so as to connect with the blackish shading from the base. The ordinary spots are incompletely defined and sometimes scarcely traceable. In dark specimens they are quite contrasting, because they are always of the lightest ground color. The orbicular is round or nearly so, varying much in size. The reniform is kidney shaped, sometimes a little constricted and not margined outwardly. It may have a smoky interior line. The secondaries in the male are white, with the veins a little smoky, and sometimes dotted to indicate an outer transverse line. There is a smoky line at the base of the fringes, from which a dirty shading sometimes extends a little toward the base. In the female the secondaries are white at the base; but become blackish outwardly, the wings being dark marked and having the outward line much better indicated than in the opposite sex. The dark line at the base of the fringes is also much better marked. Beneath whitish, the primaries smoky or at least black powdered, both wings with a more or less distinct outer line and a blackish discal spot.

Expanse, 1.24 to 1.42 inches (31 to 38 mm.).

Habitat.—From Canada southward; west to the Mississippi Valley; Jefferson, New Hampshire; Keene Valley and Long Island, New York; Mount Airy and Pittsburg, Pennsylvania; Kansas City, Missouri.

This is a characteristic yet variable species. The variation does not, however, change the prominent features of the wing and consists rather of a change in the ground color from white to quite dark smoky gray, or perhaps better in the amount of the gray shading which overlies the white base. The wing thus gets a mottled or marbled appearance which is much enhanced by the broad black mark on the middle of the costa, and by the blackish shading along the interior margin. The upward extension of this black mark on the transverse anterior line is quite characteristic and is evident in all the specimens. The black shading is really made up of two separate parts, that from the base extending to the transverse posterior line, while a broad bar extends through the submedian interspace from the outer margin inwardly through the transverse posterior line. The front in this species is distinctly bulging, and somewhat inflated. The palpi are well developed and reach the middle of the front, the anterior legs are moderately developed, the femur is slender, the tibia quite stout in proportion, with the epiphysis above the middle. The harpes are rather broad, a little curved, evenly rounded at the tip. The clasper is unique. It consists of a flat basal piece which extends from about the middle of the clasper to near its tip and then branches, the upper branch being rounded at the tip, the lower being long and pointed. From the base of this flat piece a very long stout curved process, which is pointed at the tip, extends upward.

LARVA.

HARRIS, Ent. Corr., 1869, p. 313, pl. III, fig. 3 (*americana*).—LINTNER, Twenty-sixth Rept. N. Y. State Mus., 1874, p. 135 (*americana* Harris); Twenty-sixth Rept. N. Y. State Mus., 1874, p. 157 (*funeralis*).

Stage VI.—Head large, slightly bilobed, black, coarsely shagreened; width, 3.4 mm. Body dull sooty black, a transversely elliptical, slightly raised, creamy white patch on each segment from joints 2 to 13 and anal plate, reaching to wart II. The patches on joints 3, 4, 11, and

13 are a little smaller than the others and those on 5 and 12 have a central, transverse, depressed, narrow black line, very faintly reaching between warts I and II, as if about to divide the patch. Warts I and II white, III to VI shining black, single haired except VI, which bears two or three hairs. Hairs short black, two on each side of the cervical shield, seta II on joints 5 to 10, 12 and 13 very large, long, spatulate, and striated. Length, 38 mm.

Cocoon.—"Leaves fastened together with a few threads" (Harris).

Food plants.—Hickory, birch, elm, apple.

ACRONYCTA TRITONA Hübner.

(Plates II, fig. 9, adult; XV, fig. 9, maxilla; XXI, fig. 3, male genitalia.)

Triaena tritona HÜBNER, Zutraege, 1818, p. 21, figs. 107, 108; Verzeichniss, 1818, p. 201.

Acronycta tritona GUENÉE, Spec. Gen., Noct., 1852, I, p. 42.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 53.

Apatela tritona GROTE, Can. Ent., VII, 1875, p. 221; Can. Ent., 1880, XII, p. 87; Papilio, 1883, III, p. 68.

Hyboma tritona GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color very dark bluish gray, with a more or less distinctly marked fuscous suffusion. Head and thorax without distinct markings. Primaries with the transverse markings mostly indefinite. Basal line wanting or only vaguely indicated on the costa. Transverse anterior line very feebly marked, in the best case geminate, brown, outwardly oblique, a little outcurved between the veins. In many cases it is entirely obsolete. The median shade is marked by an oblique streak from the costa crossing the reniform. The transverse posterior line is single, black, somewhat irregularly shaded outwardly, preceded by a very narrow pale line. It is rather squarely bent over the cell and incurved in the submedian interspace. A brown, smoky shading beyond the transverse posterior line merges gradually into the ground color, interrupted by a broken subterminal line, which is sometimes scarcely traceable. There is a series of discal terminal spots, beyond which there is a discal line at the base of the fringes. There is a black streak at base, extending to the inner portion of the transverse anterior line. A prominent black streak extends inwardly from just above the anal angle through the transverse posterior line. This is diffusely shaded with black and forms the most prominent character on the otherwise very evenly colored wing. The ordinary spots are very feebly marked; the orbicular is small, round, of the ground color, very faintly outlined, and sometimes scarcely traceable. The reniform is indefined, of moderate size, kidney shaped, and a little shaded with brown. The secondaries are smoky in both sexes, darker outwardly, but as a whole paler in the male. Beneath it is whitish-powdery, with very feebly marked outer lines and discal spots, which are in many cases entirely absent.

Expanse, 1.36 to 1.48 inches (34 to 37 mm.).

Habitat.—Canada to Florida; west to the Pacific coast; central New York in May; Portland, Oregon, in May; Minnesota; Mississippi; Colorado.

This species is very constant in its general appearance, and is also recognizable by the very dark, blue-gray, even ground color, on which the only prominent markings are the black basal streak and prominently shaded dagger mark close to the anal angle. The wings have rather a stumpy appearance and are thickly scaled. The front is convex and bulging, but hardly inflated, the palpi being rather short, closely applied to and hardly reaching the middle of the front. The anterior legs in the male are stout, rather short, the femur a little dilated, the tibia with the epiphysis rather near to the base. The genitalia of the male are characteristic; the harpes are oblong, distinctly broadened just before the tip; the clasper is corneous, broad, clumsy in appearance, forming a somewhat bent scoop, from the upper margin of which projects a long, finger-like process. It may be somewhat fancifully compared to the large claw of a lobster, in which the lower, movable jaw is bent to its fullest extent. The species is not at all rare, although it can scarcely be said to be very common.

LARVA.

DYAR, Insect Life, 1891, III, p. 391 (*tritona*).

Stage IV.—Head bilobed, apical tubercle produced, greenish testaceous, a brown line up from the eye to the apical tubercle, then down on the front a little way; width, 1.2 mm. Body compressed, tubercle I produced, and II also, on joint 12, especially so. Color yellowish green, greener from the food; a faint brown paired dot on joints 2 and 3, a distinct spot on 4–5, reaching wart II on 5 and divided by a pale dorsal line; a subdorsal dark line on joints 7–10, widest on 7 and narrowing behind, covering warts I–II, on joints 7–8, over II only on joints 9–10, just joining another spot on joints 11–12, which widens and covers all of joint 12, warts I–III and is narrowly produced on joint 13 to anal plate. These lines inclose a green dorsal patch on joints 8–11. Hairs few, several from a wart, pale; all simple, not glandular; a number of shorter secondary ones subventrally below the white tracheal line.

Stage V.—Head as before; the brown shade runs down from apical tubercle on the face and inward to notch of vertex, as well as all down the outer side to eyes; width, 1.5 mm. Body green, as before. Joint 6 is the only one without any brown marks. A whitish subdorsal border to the brown band on joints 7–10.

Stage VI.—Head as before; width, 2.4 mm. Body green, the brown dorsal band furcate on joint 2, widening to wart II on joint 5, suddenly absent on joint 6, beginning again at wart II on joint 7, branches running along warts II only on joints 8–11, a single band again on joint 12 covering warts I and II, which are in a square, then narrowly produced to anal plate. Warts small, green, a central long hair; subventrally spreading from wart VI.

Stage VII.—"Head medium, flattened in front, finely wrinkled; rosy pink, becoming darker on the sides and merging into shining light brown mottled with darker spots on top; neck, under side of head and antennae light colored. Clypeus transversely wrinkled, light drab. Body soft yellowish green. Two convergent black stripes on joint 2, meeting on joint 3 a broad deep purplish brown dorsal stripe, which extends across joints 3, 4, and 5, widening a little on joint 5; on joint 7 this stripe begins again, but after extending halfway across the segment it splits into two lighter dull purple stripes, which diverge slightly, then run parallel, grow darker and approach each other, meeting on joint 12, thus inclosing an elliptical area; the stripe becomes more purple in color and extends over the anal plate. Tubercles slightly raised, of the same color as the surface from which they arise, most of them crowned with a short, dark, blunt bristle and surrounded with a few long hairs. Ventral surface, especially about the legs, with a fine white pubescence. Spiracles small, oval, black. Length, 27 mm.; breadth, 4.5 mm." (C. P. Lounsbury, manuscript.)

Width of head, 3.5 mm. Sparse pale secondary hairs subventrally. Joint 12 is square above, sharply elevated, the anterior part of the body not compressed, and apparently dislocated by the green joint 6.

Cocoon.—Composed of "earth and silk." (Lounsbury.)

Food plants.—Cranberry, deerberry, *Azalea viscosa.*

ACRONYCTA QUADRATA Grote.

(Plates III, fig. 1, adult; XVII, fig. 28, leg; XX, fig. 18, male genitalia.)

Apatela quadrata GROTE, Bull. Buff. Soc. Nat. Sci., 1874, II, p. 154. Papilio, 1883, III, p. 114.

Ground color a light bluish ash gray, with a more or less well-defined reddish-brown suffusion. Head and thorax without particular markings, except for a black line at the base of the wings. Primaries with the markings fairly evident, but scarcely prominent. The basal line is geminate, but very feebly marked on the costa only. Transverse anterior line geminate, very evenly oblique outwardly. Transverse posterior line single, black, a little shaded outwardly, preceded by a paler shade inwardly and almost rigidly oblique from the costa to the hind margin, practically parallel with the outer margin. The median shade is brown, not prominent, outwardly bent over the costa between the ordinary spots, and then inwardly oblique to the hind margin at or near the transverse anterior line. The costal region usually more or less brown shaded, and beyond the transverse posterior line the wing is dusky, crossed by a pale, rather irregular subterminal line. There is a brown line at the base of the fringes, which is interrupted on the veins. A prominent black basal streak extends across the transverse anterior line. There is a small black streak in the submedian interspace between the transverse posterior line and the upper margin, and very often not reaching either one. The space between the ordinary spots is more or less black filled, forming in the best cases an almost quadrate black mark. The orbicular is large, round, of the palest ground color, and not distinctly defined. The reniform is of good size, rather narrowly kidney shaped, variably defined, but never completely so. Secondaries white in both sexes, but in the female outwardly smoky and showing traces of an outer transverse line. Beneath powdery, varying from white to smoky, with or without an outer line and discal spot.

Expanse, 1.36 to 1.68 inches (34 to 42 mm.).

Habitat.—California; British Columbia; Calgary, Canada; Nebraska, and Kansas.

This species, though widely distributed, seems to be rare, and there are no great number of specimens in any collection. I have no dates of capture. The specimens vary somewhat in ground color, and particularly in the amount of brown that may be in the wing. The species is unlike any other and easily recognizable by the square patch between the ordinary spots. The very sharply limited dash within the anal angle is also characteristic, because it does not in any instance trench upon the transverse posterior line, while in most cases it does not even reach the outer margin. Another characterestic feature is the remarkably even transverse posterior line, which is scarcely sinuate in any case and sometimes nearly straight. The head is distinct, the front bulging and a little inflated; the palpi are very well defined and reach to the middle of the front at least. The legs are strongly built, but not particularly prominent; the femur is quite moderate, the tibia strong in proportion, with a small epiphysis situated just above the middle and yet reaching to the tip. Somewhat unusually short, stout tarsi. The male characters resemble those of *occidentalis*, but the harpes are rather broader toward the tip; the clasper is distinct, with the ordinary curved upper hook and a short, rather stout pointed process from the middle of the upper margin. Four males and one female are now at hand, but I have compared others which did not show any noticeable differences.

ACRONYCTA RADCLIFFEI Harvey.

(Plates V, fig. 9, larva; VI, fig. 10, larva; XII, fig. 4, male adult; XX, fig. 17, male genitalia.)

Apatela radcliffei HARVEY, Bull. Buff. Soc. Nat. Sci., 1875, II, p. 270.—GROTE, Papilio, 1883, III, p. 114.

Hyboma radcliffei GROTE, Mitth. a. d Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color is of a very even, pale bluish ash gray. The head and thorax without obvious markings. The vestiture and coloring of the primaries is very even and smooth. The ordinary markings are all evident and usually well marked. The basal line is geminate, smoky, usually traceable from the costa to the black streak. The transverse anterior line is geminate, outwardly oblique, and rather even. The inner portion of the line is black, the outer smoky. The transverse posterior line is geminate, the outer portion black, the inner smoky and hardly distinct, mostly relieved only by the included pale shade. There is a slight brown shade just beyond the black portion of the transverse posterior line, and as a whole it is quite evenly bisinuate. The median shade is feebly marked by an oblique shade on the costa. There is a very vague, undefined, somewhat paler subterminal line and a series of smoky terminal dots. The longitudinal black streak at base is distinct and very neatly marked, extending through and a little beyond the transverse anterior line. The dagger mark opposite the anal angle is also very neatly defined and crosses the transverse posterior line, forming a distinct *psi*. The ordinary spots are of good size, incompletely ringed, a little paler than the ordinary ground color; the orbicular round or oblong; the reniform kidney shaped. Secondaries white in the male, but becoming smoky outwardly in the female. Beneath powdery, primaries smoky, secondaries almost white with a more or less defined outer line and discal spot.

Expanse, 1.50 to 1.60 inches (37 to 40 mm.).

Habitat.—Canada; New Hampshire; Massachusetts in June; Center and Albany, New York, May and June; Adirondack Mountains, New York, in August; Virginia in May.

This is a very neatly marked species which does not seem to vary much. The ash-gray color is remarkably smooth and even, and the markings are very neatly defined, making the insects easily recognizable. The head is distinct, the front convex, but hardly bulging, the palpi are well developed and rarely exceed the middle of the front, especially in the female. This latter sex is also a little broader winged than the male, and as a whole darker in color. The legs are moderately developed, the tibial epiphysis being situated unusually close to the base. The male genitalia resemble those of *occidentalis* and its near allies. The upper process is well developed and curved, with a distinct finger-like projection at right angles to the upper margin.

LARVA.

Thaxter, Psyche, 1878, II. p. 121.—Dyar, Can. Ent., 1894, XXVI, p. 17.

Stage IV.—Head pale, a little brown dotted in front; width, 1.2 mm. Body pale, food green; no marks except an orange-colored patch on joint 12 covering tubercles I and III. Hair black and white; warts with central setae and crown of short hairs. concolorous; a few secondary hairs.

Stage V.—Head large, bilobed, pale behind, but thickly dotted all over the front and apex with light red brown; clypeus paler, eyes black; width, 2.2 mm. Body greenish white, not very opaque; a broad, dorsal, olive-green band reaching to wart II, tinged with brownish, and extending from joint 2 to the square dorsal part of joint 12; warts, concolorous; hair. black and white, rather sparse, a few pale secondary ones subventrally. Later the sides are green; dorsal band brown with a faint yellow edge and a central reddish dorsal line; dorsal band not scalloped by warts II and not extending on joint 13.

Stage VI.—Head bilobed, black below, the upper half red, contrasting; width, 3.5 mm. Joint 12 enlarged and bearing tubercles I and II in a square. Body black with straight, even, yellow lines—dorsal, subdorsal (II), lateral (III), and subventral (V), the latter twice as broad as the others, all reaching from the cervical shield to the hump on joint 12; a perpendicular yellow line from wart II on joint 12 to the substigmatal line; joint 13 black above; warts small, pale, the dorsal ones bearing long white hairs (7 mm.), those on the sides short; a few, nearly obsolete, secondary hairs; length, 26 to 33 mm. The larvae have the habit of elevating the anterior end when disturbed. A single specimen, apparently destroyed by a fungus, has an abnormally marked head (Plate V, fig. 9*a*). The larva as shown in fig. 9 was made by Dr. Riley apparently from this specimen, and the coloration can not be reliable.

Cocoon.—Formed of silk and bits of wood bitten off.

Pupa.—"Slender and has a curious olive tint" (Thaxter).

Food plants.—Wild cherry and sugar plum.

ACRONYCTA FALCULA Grote.

(Plates XII, fig. 8, female adult; XXI, fig. 14, male genitalia.)

Apatela falcula GROTE, Can. Ent., 1877, IX, p. 86; Papilio, 1883, III, p. 68.—PACKARD, Forest Insects, 1890, p. 637.

Ground color a very even, dark bluish gray, which is shaded with red brown in the basal space inferiorly, and beyond the transverse posterior line; most markedly so in the submedian interspace. Head and thorax are without distinct markings, except for a black line at the base of the patagiae. The primaries have the transverse markings evident, if not very prominent; the basal line is smoky, geminate, marked on the costa only. The transverse anterior line is geminate, well marked on the costa, the inner line black to the basal streak, and beyond that more or less lost. The outer portion of the line is marked on the costa, but loses itself in the ground color long before it reaches the inner margin. As a whole the line is oblique and without distinct curvings. Transverse posterior line geminate on the costa; but beyond that the outer line, which is black, is less distinct. It is broadly bent over the cell, a little toothed on veins 3 and 4, and incurved below that point. There is a vague, irregular, paler subterminal line, and a series of blackish terminal spots. The basal black streak is very distinct, prominent, with a short spur inferiorly at about the middle, and it reaches through the transverse anterior line. There is a very prominent black streak just above the anal angle, which reaches to, but does not cross, the transverse posterior line. This black streak is often more or less brown shaded. The median shade is vaguely indicated by a brown streak on the costa. The ordinary spots are very feebly defined; the orbicular is round or nearly so, a little paler than the ground color, but not ringed; the reniform is very even, lunulate rather than kidney shaped, with a few black scales defining it inwardly, but defined only by its own paler color elsewhere. The secondaries in the female are whitish at base, smoky outwardly. Beneath, the wings are whitish powdery, with the usual more or less evident outer lines and discal spots.

Expanse, 1.40 to 1.45 inches (35 to 36 mm.).

Habitat.—Illinois; New York; Minnesota; Winnipeg, Manitoba.

Unfortunately I have females only of this species;[1] one of them, a specimen sent me by Prof. George H. French. The name of this insect is a mistake, and based upon an imperfection in the specimen. The margin below the apex is almost straight, and the least disturbance of the fringes at this point gives the impression of an excavated margin. As a matter of fact, in the four specimens before me there is only one which gives the least color to the name. The species is an easily recognizable one by the very dark, blue-gray primaries with a prominent black streak at base, and by the reddish shades which are found in the basal space and beyond the transverse posterior line. These are characteristic and unlike any other species known to me. The front of the head is a little protuberant and convex; the palpi are unusually long and well developed, extending above the vertex in one of my specimens.

LARVA.

COQUILLETT, Papilio, 1881, I, p. 6.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 637.

Stage VI.—From the only observations on record the following may be gathered: Head brownish in front, pale greenish on the sides. Body dark brown, mottled with pale greenish; a darker dorsal line reaching to tubercle I; venter greenish white. Warts small, with one or two hairs, I and II on joint 12 larger than the others. Length, 32 mm. (Coquillett). I assume this to be the brown form of a normally green larva.

Food plant.—Hazel.

ACRONYCTA PARALLELA Grote.

(Plates III, fig. 9, adult; XVIII, fig. 28, leg; XXI, fig. 15, male genitalia.)

Apatela parallela GROTE, Can. Ent., 1877, IX, p. 53; Papilio, 1883, II, p. 168.

Ground color a very even, dark, bluish ash gray. Head and thorax more or less suffused with blackish. The collar has a blackish line near the base and another near the tip, while the tip is marked by whitish scales. The head has a white line between the antennae and there may be another one across the middle. The little tuft at the base of the abdomen is unusually distinct and is often black tipped. The primaries have the ordinary markings fairly evident and sometimes very distinct. The basal line is geminate, blackish, marked on the costa only. The transverse anterior line is narrowly geminate, black, a little outcurved to the middle, where it is distinctly drawn in, and again outwardly oblique below to the inner margin. In most cases the line is more or less indistinct. The transverse posterior line is geminate, the outer portion of the line black, rather even, only a little drawn in in the submedian interspace. It is accompanied by a brownish shade, which is perceptible but not easy to locate. The inner portion of the line is smoky and not very distinct, best marked by the pale intermediate filling. There is a more or less evident, but hardly defined, subterminal line, which is paler than the ground color and somewhat diffuse. There is a narrow black line at the base of the fringes, which are cut by the broad, smoky shades. The median shade is more or less smoky, forming an oblique, blackish shade from the costa through the reniform, there bent and running inwardly as a smoky shade, reaching the internal margin at the transverse anterior line. Any portion or the whole of this shade may be absent. The basal black streak is well marked and has a short spur from the middle inferiorly. A black streak extends inward from the outer margin above the anal angle, and reaches the transverse posterior line just above vein 2. There is a shorter black dash extending nearly to the subterminal line. The ordinary spots are fairly defined; the orbicular round or nearly so, outlined in black scales, within which is a pale annulus and a center of the ground color. The reniform is of moderate size, kidney shaped, inwardly marked by black scales, then by an almost complete pale ring, the center being of the ground color. Secondaries white in the male, outwardly smoky in the female. Beneath, more or less powdery, sometimes smoky in the male. Secondaries with a more or less evident discal spot and outer line, which is frequently wanting in the male.

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[1] Since the above was written I obtained a male specimen, which shows the characters of the series in which I have placed it in all essential features.

Expanse, 1.28 to 1.40 inches (32 to 35 mm.).

Habitat.—Texas in May; Garfield County, Colorado, 7,000 feet; Denver, Colorado (Bruce); Kansas.

Six males and two females are before me, and I have seen others. The species is a distinct one, and while it very closely resembles *falcula* in all essential characters it is yet quite easily separable from it. There are none of the red shades which occur in the more Eastern species, and the details of the markings differ quite obviously. One of the most prominent points is in the fact that there is a short streak above the second vein instead of the usual simple dagger mark. This gives quite a different character to that part of the wing and makes the species an easily recognizable one. The front is convex but hardly protuberant, the palpi are well developed and reach to the middle of the front or even a little above. The anterior legs of the male are slender, the femur a little dilated at the base, the epiphysis of the tibia situated well toward the base. The harpes of the male are oblong, even, and evenly rounded at the tip. The clasper is rather slender, with a short, pointed, beak-like tip. From the middle of the upper margin is a moderate, pointed, straight process.

ACRONYCTA REVELLATA, new species.

(Plate XXI, fig. 10, male genitalia.)

Ground color a bluish ash gray. Head and thorax without special markings. Primaries with the ordinary maculation fairly well defined. Basal line brown, geminate, marked on the costa, and sometimes traceable to the basal dash. Transverse anterior line geminate on the costa, but beyond that point the outer line is obsolete, leaving only the inner black line, which is best marked from the subcostal to the submedian vein. As a whole, it is outwardly oblique, a little drawn in on the basal streak. The transverse posterior line is single, black, outwardly shaded with brown scales, bent outwardly over the cell, toothed on veins 3 and 4, and to a less extent on vein 1. There is a pale, undefined subterminal line, which is evident in proportion to the darkness of the terminal space. There is a series of blackish terminal lunules, beyond which the fringes are cut with brown. Basal streak black, distinct, extending through the transverse anterior line and almost meeting the black dash which crosses the transverse posterior line and reaches the margin above the anal angle. The basal dash has a short spur inferiorly at about its middle. Vein 1 has a black dash or shade accompanying it through the median space. The ordinary spots are fairly well marked; the orbicular round or nearly so, ringed by blackish scales; the reniform moderate in size, kidney shaped, a little marked with brownish scales. Secondaries white, with a faint yellowish tinge; in the female smoky outwardly. Beneath, white, more or less powdery, with a variably evident outer mark and discal spot, which is not marked in the males.

Expanse, 1.50 to 1.60 inches (37 to 40 mm.).

Habitat.—Glenwood Springs, Colorado, in June; Salida, Colorado, 7,500 feet; Washington.

Four males and one female are represented in the series before me, and as a whole the species is much larger and broader-winged than in *grisea*. It has much the same ground color and much the same pattern of maculation. It is a little darker, however, and it has the black dash opposite the anal angle much more prominent and heavier than in any specimen of *grisea* that I have seen. The head is small, well applied to the thorax, the front convex, but hardly bulging; the palpi distinct, free from the front, and reaching to the middle or above. The harpes of the male are broad, a little narrowed to the tip, which is rounded.

The clasper small, beak-like, and a little twisted. The specimens before me show practically no variation, and types are in the collection U. S. National Museum, Rutgers College, Mr. E. L. Graef, and Dr. William Barnes. The forelegs of the male are well developed, the femur long, dilated at the middle, the tibia moderately stout, with the epiphysis inserted unusually close to base.

ACRONYCTA GRISEA Walker.

(Plates III, fig. 4, adult; XVII, fig. 25, leg; XXI, fig. 11, male genitalia.)

Acronycta grisea WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 56.—GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 78.

Apatela grisea GROTE, Can. Ent., 1875, VII, p. 222; Ill. Essay, 1882, p. 39; Papilio, 1883, III, p. 68.—PACKARD, Forest Insects, 1890, p. 272.

Hyboma grisea GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Acronycta pudorata MORRISON, Ann. Lyc., Nat. Hist., N. Y., 1875, XI, p. 93.—GROTE, Can. Ent., 1875, VII, pp. 221, 222, pr. syn.; Can. Ent., 1880, XII, p. 188, pr. syn.

Ground color ash gray, a little mottled with brown, giving it a somewhat marbled appearance. Head and thorax without defined markings. Primaries with the basal line geminate, brown marked on the costa only. Transverse anterior line geminate, the outer line brown and more or less obsolete, the inner line blackish, also more or less obsolete; as a whole quite evenly oblique, outwardly. The median shade is indicated by a smoky streak from the costa, extending obliquely between the ordinary spots. Transverse posterior line black, single, preceded by a slightly paler and followed by a brownish shade. It is outwardly bent over the cell, strongly toothed on veins 3 and 4, and less so on vein one. A vague, indefined, irregular, pale subterminal line. A series of smoky marks at the base of the fringes, beyond which these are cut with black. There is a distinct black basal streak, which extends through the transverse anterior line and is forked from the lower side at about its middle. The black dash opposite the anal angle extends through the transverse posterior line, and is well marked and quite neatly defined. The ordinary spots are evident, though not prominent; the orbicular is round or nearly so, a little paler than the ground color, and outlined by smoky scales; the reniform is of moderate size, kidney-shaped, very imperfectly outlined, the center just a little brown shaded. The secondaries are soiled whitish, in the female smoky toward the outer margin. Beneath powdery, the disk of primaries smoky in the female, a more or less evident outer line and discal spot in both sexes.

Expanse, 1.25 to 1.40 inches (31 to 35 mm.).

Habitat.—Canada, southward to Georgia, west to the Mississippi; central New York in June; Minnesota in July.

This is quite a widely distributed species, though nowhere common. It is very constant in its general appearance; and in the examples that

I have had before me there has been no noticeable variation, except that of size, and a little in the ground color. The head is small, closely applied to the thorax; the front convex, but not bulging; the palpi well developed, free from the front and extending at least to its middle. The anterior legs of the male are well developed; the femur of moderate size, quite distinctly dilated at the middle, and the tibia moderately broad, with the epiphysis inserted close to the base. The harpes of the male are short and quite broad, a little narrowed at the tip and rounded. The clasper is distinct, twisted, beak-like, with a little tuft of diverging hair. This species can not be easily mixed with any other within its range, and its nearest ally is the Western species just described as *revellata.*

LARVA.

EDWARDS and ELLIOT, Papilio, 1883, III, p. 131.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 272.

Stage I.—Head whitish; width, 0.3 mm. Body translucent whitish, shield and anal plate dusky luteous. Setae large, distinct, dark, the bases so large as to be nearly touching, single, normal; subprimaries absent. On joints 4, 5, 6, 9, and 12 a brown dorsal patch.

Stage II.—Head bilobed, angular, with pale setae, whitish; a brown shade at the vertex; width, 0.5 mm. Body whitish, sides of the cervical shield brown. Three dark red-brown patches on joints 4–5, 8–9, and 12, covering tubercle I on joint 4, on the rest reaching to tubercle II; on joint 12 tubercles I and II nearly in line; the patch is lighter brown and extends forward on joint 11. Warts with a long hair and a few short ones, wart IV as large as any, VI present; on joint 12, II has more hairs than elsewhere. Warts conical, concolorous with the markings. Later a whitish subdorsal band appears between warts I and II, partly broken by the brown patches.

Stage III.—Head square bilobed, pale greenish, a brown oval ring mark on each side, which is produced inward and joins its fellow at the vertex; width, 0.7 mm. Body as before, wart II with three or four hairs, smaller than wart I.

Stage IV.—Head whitish, clypeus green, the ring-shaped marks on each lobe strigose, with a concentric dash above; width, 1 mm. Body pale green, subdorsal band yellowish, dorsal patches as before. Hair rather long, partly blackish.

Stage V.—Head whitish, with brown strigose mottlings over the apex and front of each lobe, except the green clypeus; a tubercule at the apex; width, 1.4 mm. Body as before; warts tubercular granular, few haired. Later the yellow band is obsolete except bordering the patches; tubercules I on joints 6 and 7 have a touch of the brown color, and the patch on 11, 12 is furcate before. In the position of rest joint 6 is much humped up, and 12 is also prominent, the head held down.

Stage VI.—The same. Width of head, about 2 mm. Practically no secondary hairs.

Stage VII.—Head purplish brown, except the green clypeus and a narrow green area outside it, slightly mottled with paler; width, 2.8 mm. Body soft yellowish green, a purple-brown dorsal band, furcate on joint 2, touching the warts I on joints 5 to 7, broken in the incisures, widening into an elliptical patch on joints 8 to 11, narrowing on 12, and continued still more narrowly to the anal plate; on joints 9 to 11 a green patch is inclosed, narrow on the posterior half of 9, where it begins, wide on 10 to cover wart I, and occupying more narrowly the entire length of joint 11. Brown spottings on the sides, especially around the spiracle and wart VI. Warts small, I on joints 5 to 8 and I and II on 12 slightly produced. Hairs short, sparse, black from I to III, the rest white, two to ten hairs on a wart. Secondary hairs nearly absent; only one or two can be distinguished on a segment subventrally. Spiracles white, with narrow black border. There is a form which is "pale brownish with a flesh tint, but agreeing in all its markings with the green form" (Edwards and Elliot).

Food plants.—Apple, birch, willow, elm, arrowwood.

ACRONYCTA CONNECTA Grote.

(Plates II, fig. 16, adult; XVIII, fig. 7, palpus; XXI, fig. 4, male genitalia.)

Acronycta connecta GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 79.

Ground color a dirty yellowish gray, more or less shot with reddish through the center of the wings. The head with a black line across the front. Thorax with a blackish line at the base of the collar; patagiae black marked at the sides. Primaries with all the markings more or less traceable, but all of them obscured by a blackish shade which extends from the base through the center of the wing and reaches the outer margin above the anal angle. This shade is not well defined, and includes the ordinary basal black streak and the black dash through the transverse posterior line to the outer margin above the anal angle. The basal line is geminate, brown, marked on the costa only. The transverse anterior line is geminate, brown, outwardly oblique, a little incurved between the veins, and more or less obscure through the central portion of its course; sometimes it is hardly traceable beyond the costa. The median shade is marked by an oblique smoky streak on the costa, extending between the ordinary spots and sometimes darkening the entire space from that point to the longitudinal dark shade. Transverse posterior line blackish, slender, lunulate, usually denticulate on the veins, very strongly incurved in the submedian interspace. There is a more or less evident pale subterminal line, beyond which the terminal space is usually a little black shaded, most prominently so just opposite the cell and again in the submedian interspace. There is a series of black terminal dots, beyond which the fringes are cut with smoky. The ordinary spots are more or less obscure; the orbicular, when traceable, is round or nearly so, more or less marked by blackish scales and centered with brown; the reniform quite large, kidney shaped, defined inwardly by black scales, but outwardly diffuse. It is shaded with reddish, which extends a little beyond it and shades into a whitish space following the interval between it and the transverse posterior line. Secondaries smoky, paler at the base; in the female with an indefined discal spot and outer line. Beneath whitish, powdery, all wings more or less evidently marked with an outer line and a blackish discal spot.

Expanse, 1.25 to 1.40 inches (31 to 35 mm.).

Habitat.—Canada in August; Staten Island, New York, in July; Washington, District of Columbia, in August; Illinois in July.

This species is quite easily recognizable by the blackish shade which extends through the wing below its middle, from the base to the outer margin. It differs altogether from *funeralis*, because the shade does not reach the internal margin, and is indefined, shading gradually from smoky into the ground color. The wings are rather narrow, the outer margin a little obtuse. It varies in the depth of the dark shading, and sometimes becomes rather confusedly marked throughout. The vestiture is a little rough, and under the lens the scales are seen to be distinctly elevated. The head is rather small, the front convex, but not bulging; the palpi are well developed but do not reach above the front. The legs are rather slender, the femur hardly dilated, the tibia long, with the epiphysis slender and inserted quite close to the base. The harpes are broad, somewhat abruptly narrowed from the under side to a rounded tip. The clasper is very stout, gradually narrowing to a coarse, beak-like process, giving rise on the upper margin to a stout, long, slightly curved process. It has a distinct resemblance in this respect to *funeralis*, although the lower process is altogether different in its character.

LARVA.

Stage VI.—Green form: "Head with a red stripe at each upper side, reaching from vertex and pointing toward ocelli, diminishing in size and becoming darker toward tip. Body largest in the middle, joint 2 somewhat suddenly depressed from side view; dark green, a broad subdorsal sulphur yellow line" covering tubercle II and just passing outside of I, "and a faint subobsolete pale stigmatal one; sparsely covered with long white hairs." Tubercles I and II "jet black, each giving rise to about one black hair. Joint 2 with two black marks, parallel, bent at right angles outward at the front end." (Riley manuscript.)

Brown form: "Carneous, the dorsum bluish and margined each side with deep yellow. Dorsal trapezoidal spots with a pale bluish annulation. Under a lens the body is covered with extremely fine elevated speckles, especially on dorsum. Joint 2 with two elbowed lines, diverging in front. Dorsal warts with black hairs, the rest long and light. Venter immaculate. Head and spiracles black." (Riley.)

Cocoon.—"Larva eats into wood, where it constructs a cocoon." (Riley.)

Pupa.—Smooth, light brown, regularly tapering; abdominal segments coarsely punctured on the anterior third; wing cases slightly shagreened. Cremaster flat, thin but wide, the lateral margin produced into a winglike plate, blackish on the edge, smooth. Posteriorly the margin is fluted and double. Hooks slender, pale, recurved at tip, the upper one on each side on top of the plate, the lower three on each side in a row situated between the two fluted rims.

Food plant.—Willow.

ACRONYCTA BRUMOSA Guenée.

(Plates XIII, fig. 1, female adult; XVII, fig. 30, leg; XX, fig. 21, male genitalia.)

Acronycta brumosa GUENÉE, Spec. Gen., Noct., 1852, I, p. 52.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 59.—BUTLER, Ent. Amer., 1887, III, p. 36=*persuasa*.
Acronycta impleta WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 57.
Acronycta subochrea GROTE, Bull. Buff. Soc. Nat. Sci., 1874, II, p. 153.
Apatela subochrea GROTE, Can. Ent., 1875, VII, p. 227, pl. I, fig. 10.—BUTLER, Ent. Amer., 1887, III, p. 36=*impleta*.

Ground color very dark, powdery, ash gray. The vestiture on the primaries elevated. Head with a transverse black line in front, collar with a blackish line inferiorly; the balance of the head and thorax black powdered. The wings are mottled with smoky brown, which obscures the ordinary markings. The basal line brown, geminate, complete. Transverse anterior line brown, geminate, tending to become indistinct below the middle; as a whole oblique outwardly. In some dark specimens the line becomes black instead of brown. The median shade is brown, best marked on the costa, where it extends obliquely into the reniform, is there bent at nearly a right angle and then runs almost upright to the internal margin. The latter part of its course is very largely obscured, and sometimes altogether wanting. Transverse posterior line geminate, the inner line only a little marked, the included space paler and lunulate; the outer line consisting of a series of black lunules, and as a whole being denticulated on the veins. It is very nearly parallel with the outer margin and only a little sinuated. The subterminal line is pale, irregular, broken, and diffuse. The terminal space is crossed between the veins by black streaks, opposite which the fringes are cut with blackish. There is a brown shading below the median vein from the base to the transverse anterior line, but no distinct basal streak. There is a similar shading opposite the cell, and another opposite the anal angle, taking the place of the ordinary streaks, which in some cases may be faintly traced. Between the transverse anterior and median lines there is a black streak just above the internal vein. The ordinary spots are traceable, of good size, but not prominent; the orbicular round or nearly so, black ringed; the reniform large kidney shaped, obscured by black scales. Secondaries yellowish white in the male, smoky yellow in the female. Beneath yellowish white, powdered, with the usual outer line and discal spots, more or less well marked.

Expanse, 1.28 to 1.60 inches (32 to 40 mm.).

Habitat.—Canada, southward to Virginia, west to the Rocky Mountains; Ontario in July; New York, May and June; Washington, District of Columbia, in August; Lancaster, Pennsylvania, in June; Racine, Wisconsin; Garfield County, Colorado, 7,000 feet.

This species is recognizable without much trouble by the very dark mottled primaries, and by the equally dark, smoky secondaries. The primaries are more than usually parallel, and rather narrow. These points, together with the elevated vestiture on the primaries, will make the species recognizable. There is little variation; some specimens are darker than others, in some the lines are black rather than brown, and in some the smoky suffusion is more distinct than in others. The species here identified as *brumosa* is what was described by Mr. Grote as *subochrea*. The original description will fit either one of two or three species, and this reference, which is so different from any that has been heretofore made, is largely due to the suggestion made by Dr. Dyar from the larval characters given. Mr. Butler thought the species to be *persuasa*; but the description will not allow this reference. It is possible to mistake *subochrea* for a rubbed *persuasa*, and I believe Mr. Butler's reference to be based upon an erroneous determination or a bad specimen. The head is of very good size, though not prominent, the front bulging, the palpi reaching to the middle and distinct. The genitalia of the male are unique; the harpes are rather narrow, long, a little dilated just before the tip; the clasper is broad, looking somewhat like a mitten with an unusually long thumb projecting from the upper side; from the upper margin there is also a very long, slender, straight process. We have here an almost perfect intermediate type between what may be considered the typical *lobeliae* form on the one hand and the form usual in the *persuasa* group on the other. The anterior leg of the male is well developed, although not unusually long. The femur is a little dilated toward base; the tibia is stout, with the epiphysis inserted above the middle.

LARVA.

GUENÉE, Spec. Gen., Noct., 1852, I, p. 52 (*hamamelis*).—DYAR, Can. Ent., 1894, XXVI, p. 18 (*subochrea*).

Stage III.—Head subquadrate, lobes pointed; pale whitish with eight brown spots, one covering the eyes, one before the apex of each lobe, and two smaller ones respectively above and below the other two; width, about 1 mm. Body deeply incised between the segments. Warts concolorous, IV obsolete. Pale translucent yellowish, a white subdorsal line below wart II. Warts II and III on joint 2 and II on joint 3 brown. Brown patches dorsally on joints 5, 8, and 9, and irregular ones on joints 11 and 12. Hairs sparse, fine, blackish.

Stage IV.—Head as before, but the lobes less pointed; upper spot twice indented; width, 1.5 mm. Body incised between the segments, joint 12 slightly enlarged. Pale green, marked as before. Hair short, blackish dorsally, fine and scant. Length, 9 mm.

Stage V.—Head much as before, the mark over the eye connected with the one above it, mottled, diffuse; width, probably 2.6 mm. Body greenish, similar to the next stage.

Stage VI.—Head bilobed, pale, with brown mottled spots on the face of the lobes, except in the middle of each at vertex; width, 4 mm. Body higher than wide, slightly enlarged at joints 5–6 and 12, these parts humped up in the position of rest. Olive green, paler subventrally, a broad yellowish white dorsal band, somewhat pinkish tinted, reaching to wart III, broken by a large dark brown spot on joints 5, 8, 9, and 12, the spots diffuse at the edge. A fainter similar mark on joint 3 and on joint 11 below wart II. Warts I to III small, with few short hairs; IV to VI small, more flattened and diffuse, with pale hairs; a few long hairs at the extremities. Secondary hairs very weak, a few present in the subventral region. Length, 45 mm.

Rarely there is a brown form, but I have no notes on it.

Cocoon.—Made of silk and bits of wood or other material on which it may be built.

Pupa.—Shining brown; length, 21 mm.

Food plant.—Witch hazel.

ACRONYCTA SUPERANS Guenée.

(Plates I, fig. 6, adult; XVIII, fig. 21, leg; XXI, fig. 1, male genitalia.)

Acronycta superans GUENÉE, Spec. Gen., Noct., 1852, I, p. 53—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 59.—BETHUNE, Can. Ent., 1869, I, p. 85.
Apatela superans MORRISON, Psyche, 1875, I, p. 42.
Hyboma superans GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color a very pale ash gray, or almost whitish. Head with the front black or nearly so, and a black or brown line above the antennae. Collar with a blackish line at the base, and also black tipped. The patagiae are also sprinkled with black scales. Primaries very strongly marked with black or brownish shades, which in a general way extend first from the base through the submedian space to the outer margin just above the anal angle, and, second, from the costa downward between the ordinary spots, including the reniform and joining the longitudinal shade. A blotchy shade extends from the transverse posterior line to the outer margin opposite the cell. These shadings vary in intensity and obscure the ordinary markings. The basal line is black, geminate, marked on the costa only. Transverse anterior line black or brown, geminate, the outer line more or less broken and quite well separated from the inner, which is obscure through the shaded portion of the wing. As a whole, the line forms two outcurves and is a little drawn in at its center. The median shade is obscured by the blackish shading, but is traceable in some specimens, and is then found to extend obliquely from the costa through the reniform, then bent inward to form the outer margin of the blackish shade as far as it extends. It is evident in the form of a lunule on the internal margin. The transverse posterior line is geminate, the inner line even, powdery, and continuous; the outer line lunulate, dentate on the veins, and emphasized by the included pale shading. The line is interrupted by the longitudinal shade. There is a pale, irregular, more or less ill-defined subterminal line, which is interrupted opposite the cell and above the anal angle. The terminal space is marked with blackish between the veins. There is a series of black terminal lunules, beyond which the interlined fringes are cut with smoky. The ordinary spots are traceable; the orbicular round, of the pale ground color, ringed by blackish scales and centered by blackish; the reniform large, kidney-shaped, but obscured by the transverse shading. At the base of the wings there is, inferiorly, a contrasting yellow patch, on which is massed a tuft of long scales which give the wing a very characteristic appearance. Secondaries smoky in both sexes; in the males a little paler. Beneath, very pale yellowish, powdery, both wings with a very distinct discal dot and outer line.

Expanse, 1.60 to 1.80 inches (40 to 45 mm.).

Habitat.—Canada, southward to Washington, District of Columbia, west to the Mississippi and Central States; Canada and New York, June and July.

This is a very strongly marked species which can not be easily mistaken for anything else. It is a large form and broader winged than usual, the primaries being more nearly triangular than in those immediately associated with it. The peculiar markings give it a blotchy appearance. A broad streak running from the base to the outer margin, joined by a broad band from the middle of the costa, gives us a pale space at the base, another one toward the tip, and a narrow pale line along the inner margin, all of these spaces, however, being broken by blackish. Finally, the peculiar patch of yellow scales at the inferior base of the wing is quite characteristic. The fore legs of the male are unusually long and slender; the femur a little dilated just before the middle, the tibia with a very large epiphysis inserted rather close to the base. The harpes of the male are very long, narrow, nearly equal, and round at the tip. The clasper is very well developed, unusually rolled together, the finger-like process from the upper angle very long and not much curved, the process from the upper margin toward base short and rather stout. The species seems to be not at all uncommon. The front is bulging and a little inflated. The palpi rather short and scarcely reaching to its middle.

LARVA.

Le Baron, First Rept. Ill. State Entom., 1871, p. 52.—Marten, Trans. Dept. Agr., Ill., 1880, XVIII, p. 131.—Coquillett, Papilio, 1881, I, p. 6.—Saunders, Ins. Inj. Fruits, 1883, p. 166, figs. 174, 175.

Stage II.—Head white with four black dots on each lobe, one on the side, one on the eye, and one beside the clypeus; width, 0.6 mm. Body white with dark brown patches dorsally on joints 2, 5, 8–9, and 12. Warts black; a narrow, white dorsal line. The warts bear a long seta and bushy crown of small hairs with enlarged ends; a few secondary hairs. Joint 12 with warts I and II in a square.

Stage III.—Head white with black spots as before; lobes pointed; width, 0.9 mm. Body white, the warts all black, pointed conic with a crown of hairs, thickly covered with short secondary hairs with enlarged tips. Dorsum broadly streaked with dark brown, cut by dorsal and subdorsal white lines. Hairs black and white.

Stage IV.—Head bilobed, whitish, a large mottled black patch below the vertex divided centrally, one over the eye, and another close to it beside the clypeus; width, 1.7 mm. Body greenish with a series of dark dorsal segmentary patches. Warts dark, those on the sides narrowly so. Primary and secondary hairs much as before.

Stage V.—Head dotted with black down the face, cut across the middle by a pale whitish band; apices of lobes pale brown; width, 2.5 mm. Body green, a chocolate-brown dorsal stripe reaching wart II, narrow on joint 13, but reaching the anal plate, broadened on the cervical shield. Hairs few, black and white.

Stage VI.—Head brown at the apices of the lobes, shading into pinkish below, mottled with black spots, especially on the front angles and in a triangular patch on the ocelli, sides and labrum nearly white; width, 3.7 to 4 mm. Body higher than wide, joint 12 angularly elevated, pointed; soft green, a narrow, rather faint, yellow subdorsal line just below wart II borders a velvety, brownish black dorsal space, narrowed at the incisures of joints 5 to 11 and a little at joint 12, continued very narrowly to the end of the body, widened on the cervical shield. Spiracles white with black rim. Claspers of feet pinkish. Warts low with only two or three hairs, I to III black, IV to VI pale, only one hair from IV, many short ones from V and VI. Some pale secondary hairs subventrally. The dorsal hairs are long, though sparse.

Food plants.—Sugar plum, apple, birch, mountain ash.

ACRONYCTA SPINIGERA Guenée.

(Plates XII, fig. 5, female adult; XVII, fig. 26, leg; XX, fig. 19, male genitalia.)

Acronycta spinigera Guenée, Spec. Gen., Noct., 1852, I, p. 45.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 55.—Smith, Bull. U. S. Nat. Mus. No. 44, 1893, p. 39.

Apatela spinigera Grote, Ill. Essay, 1882, p. 39; Bull. U. S. Geol. Surv., 1883, VI, p. 572.

Apatela harveyana Grote, Proc. Ac. Nat. Sci. Phila., 1875, p. 418; Ill. Essay, 1882, p. 39, *spinigera* Walker in part.

Ground color a very pale ashen gray, with a slightly yellowish tinge. Thorax with a smoky line near the tip, and a more or less obvious smoky margin to the patagiae. Sometimes a smoky line crosses the front below the antennae. The wings have the vestiture slightly elevated, and there is a considerable covering of smoky scales, which occasionally darkens the wing. The ordinary markings are well written. The basal line is distinct, geminate, and usually reaches to the basal dash. The transverse anterior line is brown or black, distinctly geminate, and as a whole outwardly oblique, very little irregular. The median shade line is well marked over the costa, extending obliquely into the reniform. From that point it runs a little inward to the inner margin, but is much fainter, and in some cases altogether wanting. The transverse posterior line is geminate, the inner portion very faint and sometimes scarcely marked, the intervening space whitish, the outer line black, lunulate, and more or less denticulate on the veins. As a whole it is squarely bent over the cell and deeply incurved opposite the anal angle. There is an irregular, diffuse, subterminal line, which is pale and variably marked through the terminal space. There may or may not be a series of blackish spots, most evident toward the apex of the wing. There is a series of terminal dots, beyond which the fringes are also marked with dusky. There is a slender black streak at the base, extending to the inner portion of the transverse anterior line, but not across it in any specimen that I have seen. Just opposite the cell there is a black line which extends from the subterminal line inward, and indents the transverse posterior line, but does not cross it in any of the specimens before me. A slender black line extends inwardly through the submedian interspace and across the transverse posterior line at that point. The ordinary spots are well marked and of moderate size; the orbicular round or nearly so, black ringed, sometimes with a smoky center; the reniform kidney shaped, distinctly black ringed, with a more or less well-marked smoky center. The secondaries are smoky in the male, a little paler at base; in the female more dusky throughout. Beneath whitish, powdery, the primaries often a little smoky on the disk; both wings with a more or less obvious outer line and discal lunule.

Expanse, 1.50 to 1.80 inches (37 to 45 mm.).

Habitat.—Maine to Texas; west to the Mississippi; New York in June; Wisconsin; Kansas City, Missouri, May 22.

This species is recognizable among those with the elevated vestiture by the very neat black dashes and the general distinctness of the markings. It is thus easily differentiated from *pruni*, which is its nearest ally, and than which it is also a little larger. Mr. Grote never positively identified the *spinigera* of Guenée, and generally specimens of *xyliniformis* have been marked in collections with this name. Mr. Grote mentions, however, that in the British Museum there is a specimen of *harveyana* under a *spinigera* label, and therefore Mr. Walker's *spinigera* has been cited to *harveyana* as a synonym. As a matter of fact, Guenée's description leaves no doubt that Walker was right in his identification, if indeed the name was not really attached by Guenée himself. The description fits this species completely, and fits nothing else; therefore I believe the British Museum specimen to be correctly named.

The anterior leg of the male is unusually developed; the femur is very stout and abruptly narrowed toward the tip. The tibia is short, stout, and the epiphysis is very small and inserted at just about the middle. The head is moderate, a little convex, but not bulging, the palpi easily reaching to the middle of the front, and sometimes nearly to the vertex. The harpes of the male are broad, quite regularly narrowing toward the tip, where they are rounded. The clasper is stout, of moderate length, the upper process unusually strong and curved. From the middle of the upper margin is an upward, finger-like process of moderate length, and directly opposite on the lower margin is an irregular, knob-like structure, which is furnished with a few little bristles. This species does not seem to be a common one, and I have no very large number of specimens for comparison.

ACRONYCTA PRUNI Harris.

(Plates IV, fig. 4, adult; VII, figs. 22, 23, larva; XVII, fig. 27, leg; XVIII, fig. 8, palpus; XX, fig. 20, male genitalia.)

Acronycta pruni Harris, Ent. Corresp. 1869, p. 313, pl. IV, fig. 13.—Smith, Bull. U. S. Nat. Mus., No. 44, 1893, p. 44.

Apatela clarescens Grote, in lists and coll.—Harvey, Bull. Buff. Soc. Nat. Sci., 1875, III, p. 4.—Butler, Ent. Amer., 1887, III, p. 36, an sp. dist. *clarescens* Guenée.—Smith, Bull. U. S. Nat. Mus., No. 44, 1893, p. 44, pr. syn.

Ground color a pale whitish gray, more or less black powdered and a little tinged with a greenish yellow in well-marked specimens. Head with a blackish line below the antennae. Thorax with a blackish line just below the tip, and a little tuft of yellow scales on the disk just behind the collar. This tuft is very distinct in the males, but has a tendency to disappear in the females. The primaries with the vestiture elevated, and the markings all more or less indistinct and obscure. Basal line geminate, blackish, well marked on the costa, and generally to the basal streak. Transverse anterior line geminate, blackish, outwardly oblique, a little outcurved in the interspaces, tending to become obsolete below the basal streak. The median shade is marked on the costa and extended into the reniform; but below that point it is very vaguely indicated, in some specimens traceable as a brownish shade to the internal margin. Transverse posterior line geminate, the inner portion usually more or less obscure and a little denticulate on the veins; the intervening space consists of whitish lunules. There is an irregular, pale, subterminal line, beyond which the terminal space is marked with blackish between the veins, and a little dart extends inwardly opposite the cell, indicating the ordinary black streak at that point; but this is quite usually wanting, and the streak is never distinct. There is a basal black streak which extends through the transverse anterior line and is shaded beneath with blackish. A dagger mark extends through the transverse posterior line and reaches the outer margin above the anal angle. This also is accompanied by a diffuse blackish shade, usually above the streak. The ordinary spots are of moderate size, not very well defined, more or less completely outlined by black scales; the orbicular is round or nearly so, of the ground color; the reniform is kidney-shaped and may be a little marked with yellowish. The secondaries are dirty whitish in the male; more smoky or yellowish in the female. Beneath, the wings are powdery, the primaries with the disk smoky, secondaries with a distinct discal spot, both wings with an outer line which is much more distinct on the secondaries.

Expanse, 1.40 to 1.72 inches (35 to 43 mm.).

Habitat.—Nova Scotia, southwest to Texas, west to Kansas; Nebraska; Central New York, May to July; New Jersey, May and June; Texas, March 15 to 28; Kansas, in May.

This species is, in most instances, easily distinguishable by the little tuft of yellow scales just behind the collar, combined with the elevated vestiture and the general pattern of the wing. In the female there is a tuft of hair-like scales, varying from yellow to black, visible between two of the segments near the tip of the abdomen. As a rule these hairs are yellow; but they may vary all the way to blackish. It is the only instance known to me of a character of this kind in the genus, and I have not, unfortunately, examined a fresh specimen to study the characters closely. Judging by the dried specimens it seems probable that the insect has the power to extend these tufts, one of which is clearly set on each side of the middle on the upper surface. The tufts are between the sixth and seventh apparent dorsal segments. The legs of the male are moderately developed, the femur quite even and not at all dilated; the tibia stout and short, with a small epiphysis situated above the middle. The whole structure, therefore, is entirely unlike the closely allied *spinigera*. The harpes are moderate in length and strongly dilated at the tip, which is round, and the clasper has both angles produced, so that it becomes somewhat fork-like, the lower angle being longer than the upper. From the upper margin is a slender, straight process of moderate size. As a whole, the species is a very well marked one, and resembles nothing as closely as itself.

LARVA.

HARRIS, Ent. Corresp., 1869, p. 313, pl. IV, fig. 13 (*pruni*).—FRENCH, Can. Ent., 1895, XXVII, p. 332 (*spinigera*).

Stage III.—Head sharply bilobed, light green, with three red-brown bands on each lobe, the first with an angle above reaching nearly to the vertex of the lobe; second short, lower down; third on the side, long furcate below, one branch covering the ocelli; width, about 1.3 mm. Body light green, a dark brown dorsal band reaching to wart I, inclosing wart II on joints 5, 8, 9. Dorsal warts on joints 3 to 7 high, on joints 12 also high, especially wart II; I and II in a square. Hairs rather numerous, dark from warts I and II, the rest pale; softer subventrally, with a few secondary ones. A faint pale subdorsal line.

Stage IV.—As before; width of head, about 2 mm. There is now no projection on the dorsal band at joint 5; it contains a pale dorsal line.

Stage V.—Head greenish on the clypeus and sides, face of the lobes pink, banded as before, the spaces filled with brown mottling so as to obscure the pattern; width, about 3 mm. Body hunched up at joints 3–7, 12 sharply elevated, especially at wart II. Wart I on joints 3 to 7 and 12 and II on 12 are elongated; the others low rounded, all with a small crown of hairs. A few soft secondary hairs laterally and subventrally. Sides green, with a whitish cast below, white dotted. Dorsal band brown, with pale central line, and pale yellow borders not quite contiguous to it; broad on joint 2, only a double line over wart I and joint 3 to 7, suddenly widened to wart II on joints 8–9, just covering wart I on joints 10 to 12, continued to anal plate. Dorsal hairs dark.

Stage VI.—Green form: "Bright green, the lateral tubercles scarcely discoloring the sides, slightly yellowish green. A dorsal dark reddish-purple stripe, nearly as wide as the head, on the anterior part of joint 2, about half as wide on 3, narrow on 4 to 7, expanding in two ellipses on 8 and 9, the rest of the way narrow. From 2 to back of tubercles on 3 the stripe is bordered on each side by clear white, colored a little with green on 8 and 9, with a faint greenish central line. Head rosy red, whitish on the sides, with three rows of black spots." (French.)

The brown form is the more common. Head with clypeus green, the lobes mottled with black and red on a white ground, the lines broken into patches of segregated dots; width, 3.8 mm. Body clear velvety greenish brown. Dorsal band vinous brown, conspicuously edged on joints 2 and 3, with white; very narrow and passing above tubercle I, then broadened to II on joints 8–9, reaching over I on joint 10, and mottled with salmon color, vinous on joint 13. Tubercles I on joints 3 to 7 and I and II on 12 are produced, red; the others small, concolorous. Hair black; a central hair and crown of small ones around it; a few secondary hairs subventrally. Spiracles white, with black border. Length, 30 mm.

Cocoon.—Partly bored in soft wood and formed of silk and chips of wood.

Pupa.—Red-brown, smooth, shining, abdominal segments tapering, coarsely densely punctured on the anterior third, mostly in the posterior half of the incisures; wing cases grooved and shagreened. Cremaster low, rounded, sessile, not sculptured nor differentiated from the pupa in color; two long spines on either side, scarcely curved, crossing each other at the tips, smooth, blackish, the two pairs remote, probably corresponding to the lower row. Length, 20 mm.

Food plants.—Apple, mountain ash, wild cherry, cherry, plum.

Group PERSUASA.

The species referred to this group agree perfectly in the form of the male genitalia, and differ sharply from any species in any other group. The clasper is broad, nearly flat and corneous, but is not separated from the side piece or harpe, being united by its superior edge to the inferior edge of the membraneous structure. We get thus the appearance of a pair of unusually wide harpes, abruptly narrowing near to the tip, and inferiorly much more highly chitinized. From the upper margin of the clasper there arises at the tip a stout, slightly curved, beak-like process, and from the middle of the upper margin comes a finger-like process which is usually longer, much more slender, and a little curved or bent.

Superficially the species are much alike and tend, in appearance, on the one hand to *superans* in the *lobeliae* group, and to *hamamelis* in the group of that name on the other.

The primaries are trigonate, widening quite evenly, the inner margin not greatly shorter than the costa, and the outer quite evenly arcuate to the rectangular tip. The maculation is suffused and obscured by the elevated scales, which leave no lines or dashes distinct, and the only prominent bit of ornamentation in all the species is the white or pale gray, round orbicular, in which there is always a smoky central dot.

Afflicta is recognizable by being very dark smoky or black, with all the markings broken up and only vaguely traceable. The white orbicular is the only distinct feature in the primaries, which are narrower than in any other species.

Persuasa is larger and broader-winged, of a dark ash gray, mottled with black shades. These shadings are really the diffuse ordinary streaks, and an oblique shading from the costa between the ordinary spots. The secondaries are white, with soiled veins and outer margin in the male, a little smoky in the female.

Liturata resembles *persuasa* quite closely, but it is of a clearer gray, with the darker suffusions more even, and a strigate character to the shadings. The secondaries are white in both sexes, those of the female sometimes soiled on the veins.

Marmorata is the odd species in this group, and while the markings and structure evidently refer it here, it really resembles most an exaggerated *fragilis.* The ground color is almost white, and all the ordinary lines and spots are fairly evident. The transverse posterior line is quite strongly dentate, a median shade line is traceable, and the dagger opposite the anal cell is quite obvious. The arrangement of shades and tints gives the wing a somewhat marbled appearance which makes it easily recognizable.

There are no European species known to me that belong to this group.

ACRONYCTA AFFLICTA Grote.

(Plates I, fig. 15, adult; V, figs. 1, 2, larva; XXI, fig. 19, male genitalia.)

Acronycta afflicta GROTE, Proc. Ent. Soc. Phila., 1864, II, p. 438, pl. IX, fig. 4; Trans. Am. Ent. Soc., 1870, III, p. 179.
Apatela afflicta PACKARD, Forest Insects, 1890, p. 168.
Hyboma afflicta GROTE, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896.

Ground color whitish, so densely overlaid by black scales that the creature seems almost black at first sight. Head and thorax mottled with gray and black scales. The head and base of the collar almost entirely black. The patagiae also with black markings at the margins. The primaries with all the maculation obscured and in most cases hardly traceable. All the transverse lines are fragmentary and indicated by elevated black scales; but it is scarcely possible to pick out the course of any of them satisfactorily. There is a broken, zigzag white subterminal line which is quite distinct, and there is a narrow white line preceding a series of terminal black dots. The fringes are marked alternately white and black. The orbicular is round, contrasting, whitish, with a dusky center. The reniform is obscured by the black ground color. Secondaries white in the male, becoming dusky outwardly, the veins more or less soiled. In the female the secondaries are dark as a whole, and there is a more or less obvious outer dusky line. Beneath white, strongly black powdered, both wings with a discal spot and a more or less obvious outer line.

Expanse, 1.40 to 1.72 inches (35 to 43 mm.).

Habitat.—Canada, south and southwest to Texas, west to the Rocky Mountains. Massachusetts in June; New York City in August; St. Louis, Missouri, March; Texas, March and April.

This is quite an easily recognizable species and by no means uncommon. The almost black of the primaries is relieved by the white of the secondaries and by the contrasting orbicular spot, all the other markings being more or less swallowed in the black overlaying of the scales. The inner margin of the wings is a little more gray than the rest, and when the insect has them folded it seems like a gray streak running the full length from the head to the parting of the wings. There are two rather distinct forms, though marked only in the males. In the first the primaries are almost black and the secondaries almost white, with a very narrow marginal dusky band; the second form has the primaries much more sordid in hue, the secondaries are soiled, and there is a considerable suffusion of smoky in the outer part of the secondaries. These forms run into each other, however, in such a way as to make it impossible to believe them to be even varieties, much less species. The head is distinct, rather large, the palpi well developed and reaching to the middle of the front, which is only a little convex and not at all bulging. The fore leg is very stout, the femur is much thickened, abruptly narrowed toward the tip, where it is inferiorly excavated to receive the tibia. The tibia is stout, the epiphysis inserted below the middle and reaching to the tip. The tarsi are quite stout and rather short in proportion to the rest of the leg. The male characters are as described for the section. The corneous part is squared at the tip, where there is a somewhat beak-like projecting process extending toward the middle of the upper portion of the harpes. Further toward the base there is a shorter stout corneous process or finger. There seems to be considerable range of variation in size, some of the smaller specimens seeming almost crippled in comparison to the largest.

LARVA.

THAXTER, Papilio, 1883, III, p. 17.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 168.

Stage V.—Head fleshy purple brown, shaded over the front of the lobes, thickly mottled with little pale dots segregated into patches; the upper epicraneal setae black, the rest white, coarse; width, 3 mm. Body, sordid orange greenish, brighter on joints 2 and 12, tubercles red. Dorsal vessel dark, centered with pale pigment. An obscure, double lateral line between warts II and III, resembling the faintly showing tracheae, but less straight. Warts I and II surrounded by faint pale rings. No distinct marks. Spiracles black edged. Warts I to III elongated, with a central hair and crown of smaller ones at the apex; white, except the central hair on I and II, which is black. Warts IV and V single haired, VI with several pale hairs. No secondary hairs.

Stage VI.—Head wide, slightly bilobed; brown, with purple reticulations and whitish dots over the face of the lobes, slightly shagreened; width, 4.5 mm. Body nearly uniform reddish brown, a dusky black dorsal stripe, and a faint reddish lateral one. Tubercles very small, not prominent, all single haired except VI; orange color. Setae short and fine except II on joints 5 to 7, which are long, black, slender, with small spatulate tips. In others these spatulate hairs are present on joints 5–8, 12; 3, 5–9, 12 or 3–10, 12, the number being variable to this extent. Spiracles, black rimmed. Dr. Thaxter states that there is also a "rich yellow green" form.

Cocoon.—Quite tough, composed of silk and bits of wood, partly formed by the substance on which it is made.

Pupa.—Rather thin, brown, tapering, abdominal segments very smooth, scarcely punctured at all, shining; cases very slightly shagreened. Cremaster rather broad, low, irregular and lumpy, creased below, blackish; upper hooks one on each side, slender, directed backward; lower hooks three on each side, straight, subparallel, with recurved tips. Length, 17 mm.

Food plant.—Oak.

ACRONYCTA LITURATA, new species.

(Plates XIII, fig. 8, female adult; XXI, fig. 21, male genitalia.)

Ground color a pale powdery ash gray, more or less suffused with smoky. Head with a brown line below and another above the antennae; a blackish line crosses the middle of the collar, and the edges of the patagiae are more or less black marked. The primaries have all the markings traceable, but rather obscured. Basal line is geminate, brown or black marked on the costa only. The transverse anterior line is geminate, brown or black, outwardly oblique, irregular between the veins. The median shade is narrow, obscure outwardly; oblique from the costa through the reniform and then irregular, obliquely inward to the hind margin. Transverse posterior line geminate, brown or black, the inner portion of the line less defined, the included space white or nearly so, the outer line slender and denticulate on the veins. The subterminal line is white or nearly so, very strongly dentated, interrupted opposite the cell and in the submedian interspace. The terminal space has, in the interspaces, blackish markings, more or less evident, and a series of black terminal lunules, beyond which the fringes are cut with black or brown. There is a more or less distinct basal black streak which extends through the transverse anterior line and almost to the middle of the wing. It is accompanied by a more or less obvious blackish shade which continues through the submedian interspace to the outer margin. It is sometimes sharply interrupted at the median line, leaving the space between it and the transverse posterior line of the paler ground color. There is also a blackish streak from the reniform outwardly, which becomes broader and more diffuse on the margin. In a vague sort of way the middle of the wing between the ordinary spots and to the longitudinal shade is also a little more dusky. The ordinary spots are traceable; the orbicular being rather distinct, white, outlined in black and centered with brown; the reniform may or may not be outlined by black scales, and there is usually a blackish lunule in the center. Secondaries white in the male, a little soiled at the edges; in the female the soiling extends farther toward the base of the wing. Beneath, more or less powdery; the primaries sometimes smoky, the ordinary outer lines and discal spots variably evident.

Expanse, 1.60 to 1.68 inches (40 to 42 mm.).

Habitat.—Garfield County, Colorado, 7,000 feet; Glenwood Springs, Colorado, in July; Oregon.

This species strongly resembles *persuasa* in its general appearance; but it is much paler and the markings are better defined. The secondaries in the female are almost as light as those of *persuasa* male. The harpes of the male are unusually short and broad and the corneous portion serving as clasper is hardly as distinct as in the other species. The beak near to the upper angle is moderate in size and only a little curved, while the process near the base is very short, stout, and pointed. In leg structure the species resembles *afflicta*, no essential differences having been observed. Four male and two female specimens form the types, represented in the collection U. S. National Museum, Rutgers College, Dr. William Barnes, and Mr. J. Doll.

ACRONYCTA PERSUASA Harvey.

(Plates III, fig. 11, adult; XVII, fig. 29, legs; XVIII, fig. 10, palpus; XXI, fig. 20, male genitalia.)

Apatela persuasa Harvey, Bull. Buff. Soc. Nat. Sci., 1875, II, p. 271.—Butler, Ent. Amer., 1887, III, p. 36=*brumosa* Guenée.

Ground color a deep bluish ash gray, heavily powdered with black and with a more or less smoky suffusion. Head with a line below the antennae and one on the vertex. Collar with a black line above the middle and the patagiae margined with black. Primaries with all the markings traceable; but all more or less broken, and more or less obscured by the smoky shading. Basal line geminate, black, usually marked on the costa only. Transverse anterior line geminate, black, outwardly oblique, the lines well separated and equally distinct. Median shade line slender, oblique from the costa through the reniform, thence almost straight to the hind margin. It is traceable in all the specimens that I have seen, and distinct in most. Transverse posterior line geminate, the inner portion of the line brown, the intervening space whitish, the outer line black, lunulate and dentate on the veins; it is squarely bent outwardly over the cell and not very strongly incurved below. The subterminal line is whitish, irregularly dentate, and more or less interrupted. There is a series of terminal dark marks, beyond which the fringes are marked with blackish. There is a black basal dash which reaches the transverse anterior line and a black mark from the transverse anterior line to the median shade. Both of these are accompanied by smoky or black shadings which more or less fill the submedian interspace to the median shade line. There is a distinct black streak through the transverse posterior line to the outer margin, above which there is a smoky shade extending nearly to vein 3. Another shading beyond the transverse posterior line is opposite the cell, and here we have a more or less triangular black mark. The ordinary spots are large, the orbicular round or a little oval: it is white or gray, centered with smoky, and outlined by black scales. The reniform is large, kidney-shaped, outlined by black scales and with a blackish center. Secondaries smoky, whitish toward the base, distinctly darker in the females than in the males. Beneath whitish in the male, very strongly black powdered on the primaries. In the female both wings are black powdered, and in all cases there is a more or less well marked outer black line and a black discal spot.

Expanse, 1.50 to 1.80 inches (37 to 45 mm.).

Habitat.—Southern States; Florida; Texas; Archer, Florida, in March; Texas in March and April (?); Colorado (?); New Mexico (?).

This is one of the few species that is confined to the southern part of the United States. There have been some records from Colorado and New Mexico; but it is questionable whether these are correct. Mr. Butler referred this species to *brumosa*, but as I have already shown erroneously. The localities, therefore, that have been recorded for *brumosa* can not be held as fitting to this species. In between twenty and thirty specimens before me not one of them comes from any northern locality; though this does not exclude, of course, the possibility of its occurring there. The species is quite constant, rarely becoming so dark as to make it possible to confuse it with a rubbed *afflicta*. In a general way the impression is given of a somewhat blotchy appearance, a dusky shade occurring over the reniform, another one just outside of the basal space at about the middle of the wing, a third just above the anal angle, and a fourth opposite the cell beyond the transverse posterior line. The head is of good size, the front convex but not bulging, the palpi are rather small, although they reach to the middle of the front. The anterior legs of the male are heavy, the femur very large and much dilated, rather suddenly narrow toward the tip and grooved to receive the short, stout tibia, in which the epiphysis is attached below the middle and reaches to the tip. The tarsus is short and stout. The harpes of the male are moderate in length, that portion forming the clasper being square at the tip. The process at the upper angle is stout, moderately curved and pointed at tip; that from the upper margin is slender, quite long and a little curved. Altogether the species is a well marked one.

ACRONYCTA MARMORATA, new species.

(Plates XIII, fig. 3, female adult; XXI, fig. 22, male genitalia.)

Ground color white, with a slight yellowish suffusion. Head mottled by black scales. Collar with a broad black band just below the tip and the tip black marked. The patagiae with a black submargin. Primaries with all the markings contrasting and black, giving the wing a marbled appearance. Basal line geminate, black, reaching to the basal streak. Transverse anterior line geminate, black, outcurved between the veins, so as to form almost a series of loops, both parts of the line being equally distinct. The median shade line is distinct, black, outwardly bent from the costa to the reniform, then forming a right angle and a little oblique outwardly to the inner margin. Transverse posterior line geminate, black, denticulate on the veins; the inner portion very narrow and brownish rather than black; the outer part black and lunulate, very little sinuate, and as a whole nearly parallel with the outer margin. The subterminal line is white, very irregularly dentate, and beyond it the terminal space is black marked. There is a series of black terminal lunules, preceded by a white lunulate line, the fringes cut with black. There is a black basal streak, which extends to the transverse anterior line; another streak extends through the submedian interspace from the median shade line through the transverse posterior line nearly to the anal angle. The ordinary spots are distinct; the orbicular round, white, black margined, and with a dusky center; the reniform large, kidney shaped, outlined by black scales and obscured by the median shade. Secondaries whitish, the veins marked with smoky, and a smoky outer line. Beneath white, black powdered, with a broken outer line and a discal dot on all wings.

Expanse, 1.36 to 1.56 inches (34 to 39 mm.).

Habitat.—Folsom, California, in July; Montana.

I have three males and one female before me. The Californian specimens are from the U. S. National Museum, the other from the collection of Mr. J. Doll. The species is quite different from any of its allies by the marbled appearance and the distinct white ground color. There seems to be considerable variation, but there is not enough material at hand to say just exactly what its range is. The front is convex, but hardly bulging; the legs in the male are as in the rest of the species of this series. The tibia have an unusually small epiphysis, set unusually close to the tip. The genitalia of the male have the harpes unusually short and broad, the clasper with the outer process stout, only a little curved and pointed at the tip. The process near to the base is very long, very slender, and a little twisted at the tip. It is thus radically different from anything else in the genus or in the section, and the species is undoubtedly a good one.

Group HAMAMELIS.

The species referred here agree in having the primaries rather abruptly widened at base, forming on the costa a somewhat well-marked arch or shoulder. In all of them the maculation is fairly well defined or distinct, and the ordinary spots are obvious. The transverse anterior line is geminate when completely present, and the dashes or dagger marks may or may not be obvious. The male characters are decided and practically alike in all the species. The harpes are well developed, with a diagonal chitinous ridge from the base of the upper side to the inferior margin some distance from tip, and from this arises a single, rather short, stout, curved, beak-like clasper. There is no chance of confusing this type of structure with any other in the genus and the superficial characters also ally the species fairly well, if we except *albarufa*.

Albarufa is the inevitable oddity, resembling, except for wing form, the *grisea* series in the *lobeliae* group. It is blue-gray in color, much as in *falcula* and *parallela*, and it is only by a little stretch of the imagination that the vestiture can be said to be roughened or elevated on the lines of ornamentation. The basal dash joins the transverse anterior line, which here bends inwardly, and thus there is an outcurve toward the costa and another toward the inner margin from this dash. The large reniform is centered by a reddish shade, which is characteristic, and seems to give a tint to the entire wing.

All the other species are of some shade of ashen gray or yellowish and none other has the reddish shade in the reniform.

Ovata is separated from all the others by having the basal dash and transverse anterior line exactly as in *albarufa*, that is, the prominent, inferiorly diffuse dash meets the transverse anterior line at an incurve and it darkens both the outcurves of the line for a short distance. In ground color the primaries are a pale ash-gray, with a yellowish tint, which is intensified in the large reniform. The *psi* mark opposite the anal angle is always present, usually distinct and sometimes prominent. The black mark opposite the cell is marked in all my specimens either by a distinct line, a short dash from the outer margin, or a more diffuse shading.

Modica is similar in color, but smaller. The basal dash is a fine line; the transverse anterior line is complete, geminate, evenly oblique, or with but the merest central incurve. The *psi* marks are as in *ovata*, but much less distinct. On the whole the species is a feeble copy of the preceding on a smaller scale.

Clarescens, or, as it is better known, *haesitata*, is the largest species of the group and of an even, pale ash gray, on which all the markings are well defined, though not prominent. The transverse anterior line is distinctly geminate and evenly oblique, while the basal streak is rarely well marked and may be entirely absent. The dagger mark opposite the anal angle is usually distinct, slender, and black, and is more or less evident in nearly every instance. The dash opposite the cell may be marked on the outer margin; but it is not complete in any specimen seen by me.

Hamamelis is very dark ashen gray with a smoky suffusion. In dark specimens the markings do not contrast, but when the ground color becomes paler the lines are relieved and the wings seem more or less banded. There is no evident dagger mark opposite the anal angle, and this, with the ground color, will suffice to distinguish it from the preceding form.

Increta is a much smaller and decidedly darker species, in which all the maculation of *hamamelis* is reproduced. The primaries are proportionately narrower and more subequal, and this, with the very dark colors, sometimes inclining a little to olivaceous, will make the species recognizable.

Retardata averages yet smaller, but is a very pale, whitish gray, with distinctly wider primaries. The maculation is intermediate in type between *ovata* and *hamamelis*, while on the whole the tendency to a darker basal space makes the similarity to the latter most obvious.

The species in this group are somewhat closely allied, but, I believe, distinct. So far as I am aware they have no European counterparts.

ACRONYCTA ALBARUFA Grote.

(Plates III, fig. 10, adult; XII, fig. 9, female adult; XVI, fig. 11, venation; XVII, fig. 32, leg; XXI, fig. 24, male genitalia.)

Apatela albarufa GROTE, Proc. Bost. Soc. N. H., 1874, XVI, p. 239; Papilio, 1883, III, p. 68.

Acronycta walkeri ANDREWS, Can. Ent., 1877, IX, p. 98.—GRAEF, Bull. Bkln. Ent. Soc., 1879, I, p. 93, pr. syn.

Ground color a very dark bluish gray, with a more or less evident reddish suffusion, which is more obvious on the primaries. Front whitish, with a black line at the base and some black scales at the tip, which do not form a complete line. The primaries have all the markings fairly distinct. The basal line is geminate, marked on the costa only, and sometimes not well marked even here. Transverse anterior line geminate, black, broken, outwardly curved from the costa to the basal dash, where it is drawn in very considerably. It is again outwardly curved toward the hind margin, but rarely reaches that point in its completeness. Median shade line obliquely bent from costa to between the ordinary spots. This space may be broken, and the line then extends almost upright to the inner margin. As a rule, however, the line is very faint below the ordinary spots and frequently it ends at that point. Transverse posterior line geminate, broadly outcurved over the cell, and moderately bent in the submedian interspace. The inner portion of the line is not defined and is evident only by the fact that the included space is usually whitish, or at least paler than the ground color. The outer line is narrowly black, sometimes a little lunulate and shaded outwardly with reddish. There is a vague paler subterminal line, which is sometimes quite evident and very even and again entirely obscured. There is a series of terminal lunules preceded by a white shade, and beyond them the fringes are cut with dusky. There is an evident black basal streak which extends to the transverse anterior line. It is slightly curved, so that meeting the transverse anterior line it incloses an oval space at the base. There is a somewhat well-marked dagger in the submedian interspace extending from the margin to and sometimes even through the transverse posterior line, although this is rare. Opposite the cell a blackish spur may be seen from the terminal space which in extreme cases reaches the transverse posterior line, but may be entirely wanting or marked only by a somewhat more dusky patch between veins 5 and 6. The ordinary spots are large and well marked; the orbicular round, pale, sometimes with a dusky center, neatly ringed with black in most instances. The reniform is large, kidney shaped, outwardly somewhat indefined, the center reddish brown, somewhat contrasting with the rest of the wing. Secondaries in the male white, a little margined with dusky at the base of the fringes, in the female smoky, but variable in this respect and sometimes white. Beneath white, with black powderings varying to smoky in dark females. Both wings with a more or less distinct outer line and discal spot.

Expanse, 1.20 to 1.50 inches (30 to 37 mm.).

Habitat.—Canada, south to Georgia, west to New Mexico and Colorado, Massachusetts in July; St. Paul, Minnesota, in June; central New York in May; Hot Springs, New Mexico, 7,000 feet, July and August; Denver, Colorado, July.

This species varies considerably in ground color, but not in essential characters. Sometimes the red shade is altogether wanting, and in one case the specimen is as dark as *tritona* both in primaries and secondaries. There is a great difference between the sexes, the males being much lighter throughout than the females. There seems to be a difference also between the Western forms and those from the more Eastern localities; the former being lighter throughout and appearing different on casual comparison. I have been unable, however, to discover any real difference either in maculation or in structure after examining the long series of specimens before me. The head is of good size, the front full but not prominent, the palpi distinct, reaching to the middle of the front or a little beyond. The legs are short and stout, the epiphysis of the anterior tibia being small and situated at about the middle. The genitalia of the male offer nothing peculiar, and simply agree with the description that has been already given for the group.

ACRONYCTA OVATA Grote.

(Plates IV, figs. 7, 8, adult; V, fig. 3, larva; XII, fig. 10, female adult; XIV, fig. 12, female ovipositer; XXI, fig. 25, male genitalia.)

Acronycta ovata Grote, Bull. Buff. Soc. Nat. Sci. 1873, I, p. 80, pl. II, fig. 14.
Lepitoreuma ovata Grote, Papilio, 1883, III, p. 112.
Apatela ovata Packard, Forest insects, 1890, p. 169.
Hyboma ovata Grote, Mitth., a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color a dirty yellowish gray, the yellow powdering more or less well marked in places, giving the characteristic shade to the wings. Head with a dusky line across the front; collar with a dusky line at base. Primaries with all the markings fairly evident. Basal line dusky and marked on the costa only. Transverse anterior line geminate, black or blackish, the intervening space dusky. The line curves outwardly from the costa to the black basal streak, where it is well drawn in; beyond that point it again curves outwardly, but rarely reaches the internal margin. It is usually also broken just below the costa. The median shade line is oblique from the costa to the reniform, which is sometimes a little darkened by it, and occasionally the line may be traced below the reniform to the inner margin. Transverse posterior line geminate, both lines fairly evident, though the inner is sometimes obscure, the intervening space whitish. The outer line is black or brown, sometimes a little lunulated, as a whole outwardly bent over the cell and well drawn in below. The space beyond the transverse posterior line is dusky, and through it is a more or less evident pale subterminal line which is very irregular in some specimens and strongly zigzag, though in others it is almost even. There is a series of blackish terminal lunules, usually preceded by a waved paler line, and the fringes beyond them are cut with dusky. There is a black streak at base, which is a little curved and meets the transverse anterior line in such a way as to include an oval space at the base. There is a distinct dagger mark crossing the transverse posterior line in the submedian interspace, and extending to the subterminal line only. Between veins 5 and 6 a black mark extends inwardly and sometimes reaches the transverse posterior line; but it tends to become obsolete and in some specimens is hardly even indicated. The ordinary spots are large, the orbicular irregularly ovate, black ringed, usually a little paler than the ground color. The reniform is large, kidney shaped, usually not well defined, but made prominent by the yellowish filling. Secondaries smoky in both sexes, in the females a little darker, with an outer line and a discal spot fairly evident in most cases. Beneath smoky, powdery, both sexes with an outer line and usually also with a discal spot.

Expanse, 1.20 to 1.60 inches (30 to 40 mm.).

Habitat.—New York to Texas, west to the foot of Rocky Mountains; central New York in June; Washington, District of Columbia, in May; Newton, Massachusetts, May 25; St. Paul, Minnesota, June 29; Texas in July.

I have no doubt that this is a good species. It has been asserted by those who have bred the insect that it is the same as *hamamelis;* but I believe that this is due to an error in the observations on the larvae. Certainly there is never any difficulty in separating the adults from those of *hamamelis*, and until both species have been raised from eggs laid by a female of one species I am not ready to admit that the two are the same. The most characteristic features which distinguish this species are the pale ground color through which there is a more or less evident yellowish shade; the transverse anterior line, which is more or less black filled and distinctly drawn in to meet the basal black streak so as to form an oval spot in the upper part of the basal space, exactly like that in *albarufa*. There is very little variation in the species, except that some are a little darker than others and in some the yellow is more evident than it is in others. I have examined over fifty specimens in comparison with the other species in this series and have not found any examples that were in the least doubtful. In wing form this species also approaches *albarufa* and is different from *hamamelis*. The head is distinct, front a little bulging, the palpi reaching to the middle.

The anterior legs of the male are stout, the epiphysis small and inserted at about the middle. In all essentials it is like *albarufa* and the genitalia of the male are of the same type.

LARVA.

COMSTOCK, Man. Stud. Ins. (1895), 308, fig. 374 (*hamamelis*).

Egg.—Less than hemispherical, well reticulated, the vertical ribs low and rounded, the cross lines distinct; cells at the apex without ribs, very small at the micropyle; diameter, 0.8 mm.; height, 0.5 mm.

Stage II.—Head whitish; width, 0.55 mm. Body translucent, nearly colorless, the food showing green. Warts normal, colorless, I to III elongated, each wart with four to six colorless hairs, the central primitive seta the longest. Warts I and II nearly in line on joint 12.

Stage III.—Width of head, 0.8 mm. All nearly colorless whitish, hairs all pale. Tubercles I to III distinctly elongated, with the hairs in a crown at the vertex. A few very small secondary hairs.

Stage IV.—Head whitish, with a trace of brown mottlings on the lobes; width, 1.4 mm. Body whitish or greenish, translucent, tubercles I to III yellow with a single seta and crown of hairs, contrasting, the rest whitish; several hairs on wart VI. A broken yellowish dorsal line, a broken double lateral one over warts II and III and a narrow straight stigmatal line. Subventer and feet whitish. A few little spine-like secondary hairs.

Stage V.—Head pale whitish, faintly mottled with brown in front; width, 2.2 mm. Body translucent whitish, with no marks below wart II, or the bands of the preceding stage yellowish and interrupted. Warts I and II, surrounded by a brown ring; a faint brown dorsal shading. Tubercles with but one hair, except VI, which has several hairs. Secondary hairs absent.

Stage VI.—Head dull purplish red, pale whitish over the clypeus; lower part and central suture, the upper two-thirds mottled with spots composed of groups of little whitish dots in clusters; width, 3.3 mm. Body brown, pale whitish ventrally; warts yellow, single haired. A series of large, rounded, oblique, pale yellow patches on joints 3 to 12, covering warts I and II, tinted with orange and each extending a little on to the next segment. Two lateral rows of similar spots, smaller and interrupted, not oblique. Spiracles white with black borders. Later the spots may become wholly suffused with red, becoming orange color. The skin has a covering of microscopic pile, absent on the tubercles.

Cocoon.—Composed "of bits of wood and grains of earth on or near the surface" of the ground (Goodell).

Pupa.—Light brown, shining, abdominal segments regularly tapering, sparsely but distinctly punctured almost to the posterior border; wing cases slightly grooved and shagreened. Cremaster rather prominent, rounded, slightly flattened; dorsal hook small, slender, bent backward and outward, not recurved; three equally short, stout lower hooks on each side, projecting outward, divergent from each other, slightly bent down or doubly bent, not recurved. Length, 14 mm.

Food plants.—Oak, beech, chestnut.

ACRONYCTA MODICA Walker.

(Plates II, fig. 4, adult; IV, fig. 9, adult; V, fig. 6, larva; XVIII, fig. 25, leg; XXI, fig. 26, male genitalia.)

Acronycta modica Walker, Cat. Brit. Mus., Het., 1856, IX, p. 56; Butler, Ent. Amer., 1887, III, p. 36.

Acronycta exilis Grote, Proc. Ac. Nat. Sci., Phila., 1874, p. 197.

Lepitoreuma exilis Grote, Papilio, 1883, III, p. 112.—Butler, Ent. Amer., 1887, III, p. 36, ? pr. syn.—Smith, Bull. U. S. Nat. Mus., No. 44, 1893, p. 44, pr. syn.—Grote, List Eupterotidae, etc., 1895, p. 14, an var. pr.

Ground color a dirty, very pale yellowish gray. Head with a dusky line in front; collar usually yellow at base, above which is a black line, and this may be followed by a paler line before the tip. The primaries have all the markings more or less evident, but always broken. Basal line geminate, blackish, marked on the costa only. Transverse anterior line geminate, blackish, always more or less broken, but as a whole outwardly oblique or a little drawn in near the middle. The intervening space is of the ground color, never prominently darkened. The median shade line is marked by an oblique dash from the costa to the reniform, which it does not obscure. Below that point it is marked by black scales and is irregular and outwardly bent on the veins. Transverse posterior line geminate, outwardly bent over the cell, moderately incurved below; the two parts nearly evenly developed in most cases, but sometimes the outer line best emphasized by black scales. Sometimes the lines are even; sometimes the outer line is quite strongly dentate on the veins. There is a vague, irregular, subterminal line which is paler than the ground color, and in consequence best marked in the dark specimens. There is a series of terminal lunules, sometimes preceded by a pale lunulate line. The basal black streak is traceable in all the specimens, but it is never prominent, and sometimes only a line of scales; usually it does not reach the transverse anterior line, and when it does is not distinctly joined with it. There is a black dagger mark extending from the subterminal line inward, and as a rule through the transverse posterior line to the median shade. Another black mark extends inwardly from the subterminal line between veins 5 and 6, and this does not in any of the specimens before me extend to the transverse posterior line. The ordinary spots are large; the orbicular round or nearly so, usually paler than the ground color, but it may be marked with yellowish; the reniform is large, more or less constricted in the center, and marked with reddish yellow. There is a vague reddish or yellowish shading through the center of the wing, which is hardly localized, except in the ordinary spots. Secondaries smoky in both sexes; a little darker in the female. Beneath yellowish or smoky, more or less powdery, and with a more or less obvious outer line and discal spot.

Expanse, 1.20 to 1.40 inches (30 to 35 mm.).

Habitat.—Massachusetts to Minnesota, to Texas; central New York, June and July; Washington, District of Columbia, in June; Texas, July and August.

This species is still paler than *ovata*, which it resembles by the peculiar reddish yellow shading in the wing and to which it is very closely allied. It is a small species, however, and slighter, though the range of size overlaps. The wings are narrower as a whole. In this species the transverse anterior line, while it may be somewhat drawn in at its middle, is as a whole oblique and never prominently filled with blackish scales. The basal streak which is so prominent in *ovata* is in this species almost entirely wanting. There is little variation in the examples before me, and it is only a question of more or less yellow and perhaps a little difference in size. Walker's description of the species fits this very well and fits nothing else known to me. Mr. Butler's suggestion that this is the same as Mr. Grote's *exilis* I believe to be correct. Where there are only two or three examples illustrating extremes, it may be possible to doubt that they belong to the same species, but with a goodly array of specimens no possible doubt can arise. The structural characters offer nothing to distinguish this from the other species of the group either in head, leg, or genital structures.

LARVA.

Stage VI.—Head pale whitish, mottled and reticulated with chocolate brown, darkest in a dash on each side of the median suture in front; width, 2.2 mm. Tubercles prominent, slightly conic, high, all single-haired to VI, which bears over four hairs. Ground whitish, powdered with chocolate brown, tubercles reddish at base. A brown line above wart III, defined by a pale shade above and broken only in the incisure, extends along joints 3 to 12 posteriorly, where it curves to join the dorsal line. It is most pronounced on joint 2. Dorsal line geminate, obscure, diffuse, single on joints 12–13, and stronger. Small, oblique dashes before warts I on joints 5–11; indistinct supra and substigmatal lines, curving up dorsally on joint 13; a subventral shade above wart VI; feet pale. Hairs white, not long. Warts alike.

Stage VII.—Head large, scarcely bilobed; shagreened, shiny, light brown, mottled and reticulated with brown, a blackish band from each lobe above, parallel to median suture meeting a brown V-shaped mark which borders the clypeus, passing on to the paired pieces above; a heavy brown mottling over the eye, passing backward; width, 3.3 mm. Body smooth, cylindrical, joint 12 slightly enlarged, light brown, shaded with blackish. A broad black subdorsal shade, broken at the incisures, defined above by whitish reaches from joint 2 to 12, where the shade curves sharply dorsad in the incisure 12–13, forming a black mark on the dorsum of 13 and anal plate. A faint mottled geminate dorsal line, rather sharply defined on joints 11 and 12 in a shaded V mark. Rest of body somewhat mottled, but no distinct markings. Warts very small, pale, single-haired except VI, which bears several hairs. Several hairs on the leg plate. Skin with microscopic pile, absent on the tubercles. Setae short, dusky. Length, 25 mm.

Cocoon.—"Webbed up between leaves." (Riley.)

Pupa.—Slender, tapering, light brown, shining, abdominal segments sparsely finely punctured to the posterior border; wing cases shagreened. Cremaster low, rather wide, rounded, coarsely wrinkled, blackish; upper hook slender, projecting backward and bent downward, lower hooks stout, two on each side, divergent, shortly recurved at the tips. Length, 15 mm.

Food plant.—Oak.

ACRONYCTA CLARESCENS Guenée.

(Plates III, fig. 3, adult; XII, fig. 11, female adult; XVII, fig. 31, leg; XXI, fig. 27, male genitalia.)

Acronycta clarescens GUENÉE, Spec. Gen., Noct., 1852, I, p. 54.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 60.—BUTLER, Ent. Amer., 1887, III, p. 36, *hamamelis*.

Apatela haesitata GROTE, Bull. U. S. Geol. Surv., 1882, VI, p. 575.

Lepitoreuma haesitata GROTE, Papilio, 1883, III, p. 112.

Ground color an even ash gray, sometimes with a faint suggestion of a yellowish shading. Head usually with a dusky line in front; collar with a dusky line at base and sometimes a smaller line just below the tip. Primaries with all the markings quite well distinguished. Basal line geminate, smoky, marked on the costa only. Transverse anterior line geminate, smoky or blackish, almost evenly oblique, a little outcurved between the veins in some specimens. The inner portion is usually a little better marked and sometimes black; the intervening space usually of the ground color; but toward the middle of its course it tends to become filled with smoky or blackish scales. Median shade line marked on the costa, but usually becoming less until it reappears in some specimens below the reniform. It is then very feebly marked and smoky, running parallel as a whole to the transverse posterior line. The transverse posterior line is geminate, the outer portion of the line black, the intervening space whitish, the inner line smoky and sometimes hardly traceable, the outer more or less broken, usually very narrow, but sometimes composed of lunules and quite distinct. There is a more or less evident pale subterminal line, beyond which the terminal space is darker and sometimes black marked. A series of terminal black lunules is preceded by a paler line, and the fringes beyond it are cut with smoky. There is a basal black dash which as a rule does not reach the transverse anterior line—in fact, in the over thirty specimens examined by me it does not reach the line in any case. There is a fairly evident dagger mark extending from the subterminal line in the submedian interspace, inwardly through the transverse posterior line; but this may disappear entirely in some specimens. A shorter dagger mark extends inwardly from the subterminal line between veins 5 and 6, but does not in any case reach the transverse posterior line. In some specimens there are traces of a claviform. Ordinary spots fairly evident; the orbicular large, round or oval, generally paler but with a dark center; reniform upright, large, a little constricted at the middle; it may or may not be marked with yellowish, and in some cases there is a slight yellowish tinge through the cell. Secondaries smoky in both sexes, hardly darker in the females. Beneath yellowish, more or less powdery, with an outer line and discal spot variably marked.

Expanse, 1.20 to 1.60 inches (30 to 40 mm.).

Habitat.—Canada to Arizona and Texas; New Hampshire in May; Kittery Point, Maine, in June; Massachusetts in May; central New York in June.

Mr. Butler has referred this species to *hamamelis* Guenée; but he has evidently confused what Mr. Grote separated as *haesitata* with the true *hamamelis*. Guenée's description of *clarescens* applies perfectly to *haesitata*, and this author pointed out very clearly the difference between this species and his *hamamelis*. This species seems also to have been bred by some collectors from larvae which they did not distinguish from those of *hamamelis*, and the contention is, as a rule, that the species are the same; but there are a series of characters which always suffice to separate *clarescens* from any *hamamelis* that I have ever seen. In the first place this species is always a paler ashen gray. It is always more smoothly and evenly marked, and is never so completely obscured by the dusky powderings. The transverse anterior line is never completely filled with dark scales, as is the rule in *hamamelis*. There is an approach, however, to this in some specimens, where the line becomes emphasized in the middle of its course. In *hamamelis* I have not seen any specimen in which there was a dagger mark through the subterminal line in the submedian interspace, while except in one instance this dagger mark is evident everywhere in *clarescens*. In general structure there is no difference as compared with the other species; but the anterior femur is rather more dilated toward the base than is usual, and there is a rather abrupt narrowing toward the base; otherwise it agrees with the other species.

ACRONYCTA HAMAMELIS Guenée.

(Plates II, figs. 1, 2, 3, adults; XII, fig. 12, female adult; XVIII, fig. 9, palpus; XXI, fig. 28, male genitalia.)

Acronycta hamamelis Guenée, Spec. Gen., Noct., 1852, I, p. 52.—Walker, Cat. Brit. Mus., Het., 1856, IX, p. 59.—Butler, Ent. Amer., 1887, III, p. 36.
Lepitoreuma hamamelis Grote, Papilio, 1883, III, p. 112.
Hyboma hamamelis Grote, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color a dirty ash gray, more or less overlaid by black scales, which are prominently uplifted. Head quite smoky and almost always with a more or less evident black band crossing the front. In pale specimens there is a black band between the antennae. Collar with a black band at base and another near the tip. Patagiae black powdered. The primaries have all the markings evident. The basal line is geminate, black, and usually reaches to the middle of the wing. The transverse anterior line is geminate, black, the two parts equally well marked, the intervening space more or less dusky. As a whole, it is very even, and slightly oblique from costa to inner margin. The median line is usually marked on the costa, and in the best cases extends obliquely to the reniform, below which it is again marked as a smoky shade line to the inner margin, running a little oblique inwardly and somewhat lunulate. The transverse posterior line is geminate, black, squarely bent over the cell and as squarely bent in below. The outer line is usually even and rather more distinct than the inner, which is usually lunulate, in strong contrast to the general rule. The intervening space is perhaps a little paler than the ground color, but not contrasting. The subterminal line is more or less evident, in all cases very irregular, pale, defined by blackish or smoky shadings, which are more prominent in the terminal space than before. There is a series of black terminal lunules preceded by a lunulate pale line; the fringes are cut with smoky. The basal space is more or less black filled, and there is visible an indefined black line from the base to the transverse anterior line, which is not prominent and does not indent the transverse anterior line in the least. There are no dagger marks beyond the transverse posterior line. In some specimens, usually where the base is dark, there is a very distinct dusky shading, somewhat triangular in outline, beginning in the submedian interspace just inside of the transverse posterior line and broadening to the outer margin, so that it includes all the space between veins 2 and 6. This is not present in all specimens however, and is, as stated, usually associated with forms in which there is a tendency to a dark basal space. The ordinary spots are evident and sometimes quite distinct. The orbicular is round, or nearly so, ringed with black scales, a little paler than the ground color, but with a large dusky center. The reniform is large, kidney shaped, rather indefinitely outlined by black scales, and more or less obscured in the center. The secondaries are smoky, with a more or less evident yellowish tinge. Beneath smoky or yellowish, powdery, both wings with an outer line and a discal spot.

Expanse, 1.25 to 1.55 inches (31 to 38 mm.).

Habitat.—Canada to Texas, west to South Dakota and the base of the Rocky Mountains; Maine, June and July; Minnesota in June; Missouri in March; Washington, District of Columbia, in June; central New York, July; Vermont in July.

This is a distinctly variable species in certain directions; nevertheless when once properly separated out, the variation is seen to consist rather in the relative distinctness of certain spaces than in any real change in the markings. The simplest form is one in which the entire ground color is evenly powdered with smoky or blackish. In this none of the markings are prominent, and the elevated scales are distinctly visible. Another may become slightly paler throughout, except for the lines and other markings, and in such cases there will be more contrast and the maculation will be more distinct. The tendency is to the formation of a band over the transverse anterior line. The two parts of the line are unusually well separated and quite even, the space between them blackish. The lower part of the basal space also tends to become powdered, and sometimes the entire region is more or less shaded. In such cases the median space is usually contrasting, and we get another triangular shade extending from the outer part of the median space to the outer margin. This species never has a dagger mark running inwardly from above the anal angle, and it is therefore separable in all cases from *clarescens*. I have seen no specimen, out of nearly two hundred that I had for examination, which I could not readily refer to either *hamamelis* or *clarescens* without hesitation. Some faded specimens or rubbed examples of *hamamelis* may at first seem to resemble *clarescens*; but a very little study will show the difference between the two very distinctly. There is nothing that is at all characteristic or different from the rest of the series in structural characters; but as compared with *clarescens* the anterior femur is decidedly more slender. The species is a common one and has been often bred. I am not aware, however, that any number has been raised from a single batch of eggs, and any suggestion that a series of specimens were specifically identical merely because the larvae seemed to be so, can not be considered as proof of the fact asserted until it has been shown that there was no variation in the larvae.

LARVA.

GUENÉE, Spec. Gen. Noct., 1852, I, p. 52 (*brumosa*).—GOODELL, Can. Ent., 1877, IX, p. 61 (*hamamelis*).—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 169 (*brumosa*); Fifth Rept. U. S. Ent. Comm., 1890, p. 169 (*orata*).

Stage I.—Whitish, translucent, setae all white except two on the cervical shield, single, pointed, no subprimaries; I and II in a square on joint 12. Tubercles large, white; no marks, but the food gives a greenish tint. Head round, whitish or slightly testaceous; width, 0.3 mm.

Stage II.—Head sharply bilobed, white; width, 0.4 mm. Body colorless, the food green. Tubercles white, high, with central seta and crown of about four shorter but equally thick ones. Warts IV and V single haired, not high; VI of two small setae.

Stage III.—Head, 0.7 mm.; whitish, body faintly greenish; warts slender, long, smooth, conic, concolorous, with central seta and small diffuse crown; all white, I–III; IV smaller, V single haired, VI with several long hairs. No secondary setae except possibly subventrally on joint 12–13.

Stage IV.—Head, 1.1 mm.; whitish, tubercles on the epicranium yellow and a brown dot below the upper tubercle. Body greenish, tubercles yellow with some dots around I and II. Hairs white, single, with small bristly crown of secondary hairs.

Stage V.—Head, 1.8 mm. As before.

Stage VI.—Head, 2.5 mm. wide; pale whitish, granular, a small brown reticular streak on each lobe above. Tubercles large, single haired with a trace of the crown of short hairs. Tubercles yellow, as also a dorsal, subdorsal and lateral row of spots. Ground color sordid, faintly reddish tinted.

Stage VII.—Brown, a blotched dusky blackish dorsal stripe, cut by pale areas around warts I and II; these areas reddish brown, concolorous with the body. Sides slightly mottled. Tubercles and setae white, spiracles black. Otherwise as in *ovata.*

Food plants.—Oak, chestnut, birch.

ACRONYCTA INCRETA Morrison.

(Plate XII, fig. 13, female adult.)

Acronycta increta MORRISON, Proc. Bost. Soc., N. H., 1874, XVII, p. 131.
Lepitoreuma increta GROTE, Papilio, 1883, III, p. 112.

Ground color very dark smoky gray with a slight yellowish shading. Head without distinct markings; collar usually dark at base; patagiae black powdered. Primaries with all the markings distinct. Basal line black, geminate, reaching to the inception of vein 1. Transverse anterior line black, geminate, very evenly oblique, the space between the two defining lines more or less black filled. The median line is marked on the costa and again below the reniform, but it is usually obscure and not distinctly traceable. The transverse posterior line is geminate, black, squarely bent outwardly, and almost as squarely bent in on the submedian interspace. There is a very obscure subterminal line, which is best marked in the pale specimens, and emphasized by the slightly darker terminal space. There is a series of terminal dots or lunules from which black rays are sent inwardly, more or less defining a lunulate terminal pale line. There is a broken and irregular black line at base, which reaches the transverse anterior line, but does not always reach the root of the wing. There are no dagger marks. The ordinary spots are of moderate size and not well defined. The orbicular is round, of the ground color or a little paler, with a dusky center. The reniform is large, upright, slightly drawn in at the outer margin. The secondaries are smoky, a little paler in the males. Beneath smoky, more or less powdery, with a dusky outer line which is much the best marked on the secondaries and a more or less evident discal lunule.

Expanse, 1.16 to 1.28 inches (29 to 32 mm.).

Habitat.—New York; New Jersey; Texas; New Mexico.

This species resembles *hamamelis*, but is distinctly smaller throughout, decidedly narrower winged, and as a whole much darker. Of the eight specimens before me seven were collected by Mr. Doll, who says that he finds the pupae very early in spring. The species is not by any means a common one, and is but rarely represented in collections. It may be that it is sometimes taken and discarded as an undersized *hamamelis*. One specimen has a very dark smoky ground color, with a faint greenish tint that is quite characteristic, but other specimens are much like the average run of *hamamelis*, except for the size and narrow wings. There is nothing characteristic in the structural details.

ACRONYCTA RETARDATA Walker.

(Plates II, fig. 5, adult; XII, fig. 14, female adult; XXI, fig. 29, male genitalia.)

Microcoelia retardata WALKER, Can. Nat. & Geol., 1861, VI, p. 38.—GROTE, Can. Ent., 1877, IX, p. 26 = *dissecta*.

Acronycta dissecta GROTE and ROBINSON, Trans. Am. Ent. Soc., 1870, III, p. 178, pl. II, fig. 81.

Lepitoreuma dissecta GROTE, Papilio, 1883, III, p. 113.—SMITH, Bull. U. S. Nat. Mus., No. 44, 1893, p. 45, pr. syn.

Ground color whitish gray. Collar with a dusky line at base. Primaries with all the markings evident. Basal line geminate, reaching nearly to the middle of the wing. Transverse anterior line geminate, black, outwardly oblique and a little curved. A black mark on the costal vein seems to bring the inner part of the line to the extreme base of the wing. The median line is well marked on the costa, extending obliquely to the reniform and rather vaguely marked below, though running close along the transverse posterior line to the outer margin. The transverse posterior line is geminate, both lines lunulate, smoky to black, the intervening space whitish, on the whole best marked opposite the anal angle. It is rather evenly and not too strongly bisinuate. There is a vaguely marked subterminal line, indicated rather by differences in shading than in any other way. A series of black dots is at the base of the fringes, beyond which they are cut with brownish. There is an incomplete and usually indefined line from the base to the transverse anterior line. Opposite the cell the space to the transverse posterior line is darkened, and in some specimens there is a vague suggestion of a dagger mark. Sometimes the shading beyond the transverse posterior line is rather prominent opposite the cell. The ordinary spots are large, incompletely defined, and not contrasting; the orbicular of the ground color, ringed with black scales, and with a smoky central dot; the reniform large, a little kidney shaped, of the ground color, usually with a dusky central lunule. Secondaries white to smoky, darker in the females. Beneath smoky; the secondaries paler, more powdery. An outer line and a discal spot are usually present, but always most distinct on the secondaries.

Expanse, 1.08 to 1.20 inches (27 to 30 mm.).

Habitat.—Canada to Virginia; west to the Mississippi Valley; Massachusetts in July; central New York in June and July.

This is the smallest species of the series, and as compared with the others the wings are a little more triangular and broader for their length. It is also the palest species, and, as a rule, the median space is much the palest part of the wing; the basal space being darker, and the dark shadings along the the transverse posterior line obscuring that part of the wing. The variation is all in the direction of suffusion, and I have seen examples that are dark greenish smoky, with the ordinary lines and spots of the usual whitish gray color, and, therefore, strongly constrasting. While the sexual characters are on the whole referable to this group, there is a distinct tendency toward structures like that found in *noctivaga* in the next group. The clasper is more hook-like and evenly developed than in the other species referred here. In other respects the structural characters correspond to those with which the species is associated.

LARVA.

Stage II.—Head bilobed; width, 0.4 mm. Larva all whitish, no marks; warts concolorous. Several hairs from each wart alike, not in a crown of shorter ones; stiff and not long except from joint 2; white, some of the dorsal ones dark.

Stage III.—Resting with the head turned on one side on the underside of the leaf. Head bilobed, high, pale yellowish, dotted with a more opaque color; width, 0.7 mm. Body greenish, paler subventrally; warts round, knob-like, I to III, large, pale yellow; IV to VI, small, greenish. Hairs few, coarse, white; some of the dorsal ones blackish. Segments slightly annulate, faintly concolorously streaked transversely; a broken white dorsal line.

Stage IV.—Head pale brown, mottled on the vertex; width, 1.2 mm. Body with a vinous brown streak below warts I and II, reaching wart III. Segments folded, annulate, more whitish on the folds. Warts I to III reddish. A white dorsal line; hairs pale.

Stage V.—Resting on the upper side of the leaf. Head slightly bilobed, whitish, mottled with brown dots; width, 1.8 mm. Body whitish, with four wine-red transverse stripes on each segment, crossing the dorsum to wart III, distinct between warts II and III, faint dorsally, the second stripe converted into a double rounded spot between the warts of row I. Warts I to III, pale orange, the rest concolorous with the body; wart II smaller than I, IV and V small. Hair rather long, except from warts I and II, where they are shorter and dark.

Stage VI.—Head whitish, mottled with pale brown, a row of darker dots close to the sutures of clypeus and median suture; width, 2.5 mm. Dorsum to the spiracles shaded with purplish and containing the transverse bands, lateral region, venter and feet yellowish waxen white. Dorsal segments with five dark vinous red bands, reaching wart III. First nearly cut dorsally and not reaching so far down the sides as the others; second broken by tubercles I, the dorsal segments formed into a pair of rounded spots, third broken by wart II, its dorsal segment faint, but continuous; fourth narrow, faint dorsally; fifth in the incisure, as long as the first band. Warts I and II, and also III in a less degree, short, erect, smooth cylinders, bearing a crown of stiff black hairs; IV to VI small and with few soft whitish hairs. No secondary hairs. Skin points minute, rather sparse, a little larger in the round ad-dorsal dot formed of the second band.

Cocoon.—Small, not very thick, composed of silk and bits of wood, or leaves bitten up.

Pupa.—Smooth, brown, tapering, the abdominal segments coarsely and densely punctured nearly or quite to the shagreened posterior incisure; wing cases not grooved and only slightly wrinkled. Cremaster a low, wide prominence, usually broad and sessile, not differentiated in color or sculpturing from the rest of the pupa. Above on each side one, below two short, thick, black spines, projecting obliquely outward, conic, their tips not recurved. Length, 8 mm.

Food plant.—Maple.

Group AURICOMA.

All the species of this group have the vestiture more or less elevated or roughened, and the primaries so powdered that the maculationship is obscured. There are no distinct black daggers or dashes except in *xyliniformis*, which is the best marked species of the group and the only one in which the transverse maculation is at all clearly defined. As a rule the tendency is to a longitudinal suffusion or strigate type of maculation. There seem to be two or three series represented, derived from different points in the *lobeliae* group, but difficult to define. All of them, however, come from one of the types in which the vestiture is roughened.

Illita and *luteicoma* are obvious derivatives of the *brumosa* type or of some form between it and *pruni*, from which also *xyliniformis* and its allies can be drawn in a different direction. All these forms are long winged and tend to a lanceolate type, the median lines becoming strongly dentate.

Noctivaga, *sperata*, *emaculata*, *impressa*, and *distans* are smaller species, very similar in type of maculation, with short, obtuse, trigonate primaries, and an evident tendency to the *connecta-alni* type of maculation.

Luteicoma and *illita* are long and rather narrow-winged species, the outer margin of primaries being oblique, rounded, and with the apices a little marked. The ground color is ash gray, and the maculation is only a little darker. All the transverse lines and the ordinary spots are traceable, though broken; but there are no longitudinal streaks, dashes, or shades, and no tendencies to a strigate type of maculation.

Illita is from the Rocky Mountain region, with the primaries much darker and the secondaries much lighter than in the Eastern *luteicoma*.

In the latter there is a distinct luteous shading, especially well marked in the secondaries, of which there is no trace in the former.

Sperata, *emaculata*, *distans*, *impressa*, and *noctivaga* have short, stumpy, trigonate primaries. All of them have a distinct, round orbicular, a very large, smudgy reniform, all the transverse lines distinct, and a more or less obvious median shade line.

Sperata, which is of a very pale ash gray, has no other markings. and even what there is does not contrast. It is an inconspicuous, powdery form, and recognizable thereby.

Emaculata is quite as powdery, but very much darker, so the black lines do not distinctly contrast. It has added a black, shaded streak at base, a black claviform, and a dusky shade near the anal angle.

Distans is much paler gray in ground color, hence the black lines and markings contrast more decidedly. The markings are as in the previous species, but the shadings below the submedian vein are more diffuse and prominent, and usually darken the wing from base to anal angle. There is often a break, however, between the claviform and the transverse posterior line in this dusky shade. As a whole the primaries are narrower and more pointed, and on analysis the resemblance to *alni* becomes strongly evident.

Impressa is broader winged and has the apices of primaries less marked. It is a clearer gray form, with all the markings distinctly written, and there is no continuous dark shading through the lower half of primaries. In the female the transverse anterior line is always distinct, while in *distans* it is almost always broken and obscured. *Distans* and *impressa* are very closely allied, and I would scarcely have cared to separate them on imaginal characters had not Dr. Dyar noted a difference in the larvae, which gave additional value to the points above noted. With extremes at hand, no difficulties can arise, nor if there is a good series of each form for comparison; but with a small number of variable specimens it may not be easy to decide as to the species.

Noctivaga is sharply defined by its mottled black and white appearance. The ground color is white, or nearly so, and all the lines, spots, shades, and dashes are black and diffuse. The secondaries are dark smoky, and altogether this form is hardly to be mistaken.

All the other species are more or less strigate in their type of maculation, and this is particularly true of *barnesii*, *perdita*, and *edolata*, in which the primaries appear blackish. *Barnesii* and *perdita* have the primaries evidently trigonate, though with a long, evenly curved outer margin and acute apex. *Barnesii* is paler in ground color, but all the transverse maculation has disappeared, while of the ordinary spots the reniform is sometimes traceable as a smoky lunule. The wing as a whole seems darker inferiorly, owing to a prominent black shade, which extends through the submedian interspace from base to anal angle.

Perdita has the primaries more uniformly blackish, but both the ordinary spots are traceable, and the transverse posterior line may be made out as a somewhat paler, bisinuate shade.

Edolata has the primaries narrower and more nearly equal. The transverse posterior line is easily traceable and is very strongly dentate. The strigate marking is fully developed here and besides the black line in the submedian interspace there is another through and extending outwardly beyond the cell.

Extricata and *xyliniformis* are ashen gray species in which the strigate type is not so strongly developed as to obscure everything else, and where the transverse maculation is at least more obvious.

Extricata is somewhat larger, and darker bluish gray. The transverse anterior line is not well marked in most specimens, sometimes absent, and the transverse posterior line is strongly denticulate. There is a distinct tendency to an angulated, median shade line, which, indeed, is sometimes distinct and complete. A long basal dash, a streak crossing the transverse posterior line opposite anal angle, and a black streak below the ordinary spots in the cell emphasize the streaky appearance.

Xyliniformis is a painfully variable species; not because it can be confounded with anything else, but because, with a few specimens from well-separated localities, it allows itself to be so prettily divided into two series. It is ash gray in color, sometimes so densely black powdered that all the markings are obscured and sometimes so sparsely that it seems much lighter in ground color, and all the maculation is evident. Large, dark, and powdery specimens sometimes resemble *extricata*, but always differ by the absence of a longitudinal black basal line. The dash opposite the anal angle is almost always distinct, and usually crosses the transverse posterior line, though it rarely forms a well defined *psi*. The ordinary spots are usually distinct and always traceable.

Oblinita and *lanceolaria* agree in the very pale gray primaries, which are narrow, long, and sublanceolate. The head is a little more sunken than usual, and there is a distinct tendency to a short tongue, more marked in *lanceolaria* than in its ally.

Oblinita is rather smaller in average expanse, much more powdery and streaky in appearance, with the median lines so far as traceable very strongly dentate.

Lanceolaria is much more evenly colored, and has a very smooth bluish tinge over the white ground. The transverse posterior line, which is the only one obvious in my specimens, is very even, hardly contrasting, and accompanied by a paler shade inwardly.

Insolita is unknown to me, but is associated in wing form with *oblinita* by Mr. Grote. It is also given the more sunken head and other characters of the series, differing by the black primaries.

The general structure of the male clasper may be compared to a thumb and forefinger held so as to form an acute angle, the finger or longer process up. The variation is in the proportion of these parts to each other, the tendency in our species being to the disappearance of the thumb and to the formation of a single, long curved hook similar to that in the first or *americana* group.

In the stumpy-winged series *sperata* is, on the whole, the most typical, with the thumb well developed, stout, and pointed at tip; the finger of moderate length, more slender, and easily curved to the pointed tip.

Emaculata strengthens the thumb and shortens it a little, while the finger is much lengthened, becomes much stouter, and is nearly straight to an abruptly pointed tip. *Distans* and *impressa* intensify this structure, the thumb being perhaps a little longer and the finger a little shorter.

Noctivaga, on the other hand, loses the thumb almost completely, the finger remaining much as in *sperata*.

Of the strongly strigate species, *barnesii* is like *sperata*, with the thumb greatly strengthened, but the proportions not much changed in other respects. *Perdita* is similar, but here the finger is also strengthened, though it becomes shorter. In *edolata* the thumb is much reduced, forming, indeed, a mere beak or spur, while the finger is very long, slender, and curved. This type is also found in all the other species of the group, the tendency to lose the thumb becoming absolute in *oblinita*, which then may be confused with the group *americana* at first sight. Unfortunately, I have had no male of *lanceolata*.

Of the European specimens referable to this group, I know *auricoma*, *rumicis*, *euphorbiae*, *myrica*, and *menyanthidis*, all belonging in a general way to the stumpy-winged form.

Euphorbiae in sexual structure is almost identical with *sperata*, and the species resemble each other very closely.

Myrica bears the same relation to *euphorbiae* in genital structure that *noctivaga* does to *sperata*, and here also the European and American species are very close structurally, while totally different in superficial appearance. *Myrica* is a very dark, evenly powdered, ashen gray, on which the ordinary markings are easily traceable, though they are not prominent.

Auricoma and *rumicis* represent the form found in *impressa*, our species standing almost midway between the two European forms in structure and resembling both superficially.

We have nothing resembling *menyanthidis*, in which both finger and thumb are long, slender, and curved, the thumb distinctly longer and a little up curved. Here we have a very distinct tendency to the *alni* type, which is not much contradicted in superficial appearance if we eliminate the peculiar black shading of the latter There is nothing in the European species known to me which resembles our narrow-winged species. *Abscondita*, of which I have only a single specimen, resembles *euphorbiae* and will probably have similar sexual characters.

Ligustri has sexual structures totally unlike anything else in the genus and should be excluded from it even on superficial characters.

Megacephala is also unique and utterly unlike anything represented in the American fauna. There is nothing to contradict its reference to *Acronycta*, however, though I am at a loss as to how the structure could have been derived from anything known to me.

ACRONYCTA ILLITA, new species.

(Plates XI, fig. 12, female adult; XVIII, fig. 22, leg; XXII, fig. 1, male genitalia.)

Ground color a dirty ashen gray, very powdery. Head and thorax without distinct markings. Primaries with all the markings obscured. Basal line geminate, black marked on the costa only. Transverse anterior line geminate, smoky or blackish, as a whole oblique, more or less outcurved between the veins. The median shade line is marked by an oblique dash on the costa only. Transverse posterior line geminate, lunulate, the inner line hardly defined; the outer broken, composed of smoky or black lunules, the intervening space a little paler. Subterminal line pale, rather vaguely defined, broken, followed by a series of black lunulate marks. There is a series of black terminal dots, before which the terminal space is a little paler. A few black scales indicate a basal, longitudinal line, and there is a feebly marked line above the anal angle, extending from the transverse posterior line to the outer margin. The ordinary spots are very obscure, of moderate size, the orbicular a little oval, centered with dusky; the reniform large, incomplete, more or less kidney-shaped, dusky, with a very pale central crescent. The space between the ordinary spots is paler than the rest of the wing. Secondaries soiled whitish, the veins a little dusky. Beneath white powdered, with a more or less obvious discal spot, but in the specimens before me without an exterior transverse line.

Expanse, 1.76 to 1.88 inches (44 to 47 mm.).

Habitat.—Denver; Glenwood Springs, Colorado, July.

Four specimens, not in the best of condition, are at hand. Three of them are males, the fourth is a female, with one pair of wings only. The species looks, at first sight, like a very dark *luteicoma* and resembles that species most nearly. I believe it to be distinct, however, and the very dark-powdered primaries, with secondaries in which there is no trace of yellow, give the creature a very distinctive appearance. The head is well developed, the front convex, but hardly bulging, the palpi closely applied to the front, and reaching the middle. The legs are well proportioned. The anterior leg of the male has the femur rather slender, the tibia large in proportion, the epiphysis inserted at about the middle and scarcely reaching to the tip. The harpes are moderate, and narrow slightly to the tip, where they are rather evenly rounded. The clasper is slender and strongly curved toward the tip, the inferior process very short and blunt. It is more than probable that this species is not rare in its range.

ACRONYCTA LUTEICOMA Grote and Robinson.

(Plates I, fig. 5, adult; VI, fig. 16, larva; XV, fig. 18, head; XVIII, fig. 23, leg; XXII, fig. 2, male genitalia.)

Acronycta luteicoma GROTE and ROBINSON, Trans. Am. Ent. Soc.,1870, III, 179, pl. II, fig. 83.

Pharetra luteicoma GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, p. 7.

Ground color a dirty, powdery ash gray, with a more or less well-marked yellow tint. The collar is usually a little dark at tip, and the patagiae often have a dusky margin. Primaries, with all the markings traceable, though not prominent. Basal line geminate, black or blackish, usually reaching to the middle of the wing. Transverse anterior line geminate, outwardly oblique, outcurved between the veins. The median shade when best marked extends obliquely from the costa across the reniform, then makes an acute angle, and extends obliquely inward to the middle of the internal margin. Between this and its entire absence all intergrading forms are found. Transverse posterior line geminate, the inner line incompletely defined, the outer smoky or blackish, lunulate, the included space whitish and also lunulated. As a whole, the line is somewhat S-shaped. The subterminal line consists of a series of more or less connected white spots, outwardly margined by blackish lunules or dashes which do not reach the outer margin. There is a series of black terminal dots. There is no trace of a basal black line. In some specimens there is a blackish shading just below the submedian vein, between the transverse anterior line and the median shade. The ordinary spots are of good size, the orbicular irregular, round or oval, defined with black scales and with a dusky center, the reniform large, kidney-shaped, outlined by black scales and shaded with dusky. The secondaries vary from soiled whitish with a yellowish tinge to smoky yellow, those of the female being as a whole the darker. Beneath whitish powdery, sometimes with a vaguely defined outer line and more usually with a discal spot.

Expanse, 1.50 to 2 inches (38 to 50 mm.).

Habitat.—Canada, southward to Georgia and Texas, west to the Central States. Maine in June; central New York in June; District of Columbia, April and May; central Illinois in August; Texas in February; ? California.

In my catalogue I have also recorded the species from Colorado, and Portland, Oregon. It is more than likely that these localities refer to the preceding species; but I do not have the specimens at the present time to refer to. Dr. Dyar records the larva from California, but points out a difference which may really indicate a good species.

This is the largest and narrowest winged species in this group, which has no tendency to a lanceolate type. The primaries are subequal and the outer margin is roundly oblique, leaving the apex just a little acute. Two forms are distinguishable, depending upon the amount of yellow suffusion. In the one case the secondaries are almost white in the male and have only a slight yellow suffusion in the female. In the second series the males are as dark as the females of the first, while the females are distinctly darker. Unfortunately both forms have been bred from the same lot of caterpillars, so that this does not point to even a good variety. The difference indeed is not great, and is not noticeable, except with a good series of specimens, where the massing of the two forms increases the apparent difference. In head structure this species is like the preceding, but the legs are decidedly stouter, the femur particularly being very heavy, while the tibia is stouter and shorter in proportion. The epiphysis is situated nearer to the tip, which it easily reaches. The harpes are much as in the preceding species; the clasper is long, moderately slender, not much curved; the inferior process is distinct, acute, and somewhat beak-like. This is one of the common species.

LARVA.

THAXTER, Papilio, 1883, III, p. 16.

Stage I.—Head blackish testaceous, whitish above the mouth; width, 0.4 mm. Body greenish, with black warts bearing long, stiff hairs. Cervical shield and anal plate blackish. On joints 5, 8–9, and 12 a series of diffuse, brown, dorsal patches. Warts without subprimary ones, three hairs from I*a* + I*b*, on thorax, and from I on abdomen; otherwise single-haired.

Stage II.—Head bilobed, brown-black, shining, labrum white, and a white line on each side of the clypeus; width, 0.6 mm. Body greenish white, the warts large, black, smaller on joint 11. Hair bristly, black, sparse on joint 11, some overhanging the head.

Stage III.—Head bilobed, flat in front, black and shining; mouth reddish; width, 0.9 mm. Body enlarged dorsally at joint 12, and apparently so at joint 5, as this part is held highest. Body whitish, almost white in places, especially subventrally on joints 10 and 12. Warts normal, black, IV very small. Hair bristly, black, weak on joint 11, thick and tufted dorsally on joint 5.

Stage IV.—Head bilobed, rounded, shining black, clypeus bordered with white, mouth pale brown; width, 1.4 mm. Body black, a subdorsal row of pale yellow spots, forming a band on joints 10–12; a narrow line below it; a similar band subventrally. Hair thick, bristly, black and white, with tufts of shorter soft hairs from warts I to III on joint 5, and two smaller divergent subdorsal ones on joint 12. A narrow white subdorsal line. In another example there were also white tufts from wart II on joint 4 and warts I and II on joint 6.

Stage V.—Head high, shining black; mouth and two bands, converging above, on each side of the clypeus, white; width, 2 to 2.2 mm. Body as before, with some long white hairs, the tufts on joint 5 brown or black; a smaller white tuft on joint 6; short divergent black pencils on joint 12. In Californian examples the subdorsal and subventral bands become strongly shaded with red, while they are pale in Eastern examples at this stage.

Stage VI.—Head whitish behind, mottled with brown and shaded with black in a diffuse band from the ocelli upward and on each side of the clypeus; mouth parts and under side of head largely black, shining; width, 3.3 mm. Body cylindrical, tapering slightly, joint 12 a little enlarged. Wart I as large as the others, IV minute. Body strigosely mottled with black and white, the black predominating and becoming continuous centrally on the segments and adjoining the narrow, broken, yellow dorsal line. Broad subdorsal and substigmatal lines, the former broken and obsolete anteriorly, yellowish white, pale red in the middle. Warts pale, with fleshy tint. Long hairs, pale, slender; those from warts I and II shorter and more spiny, the warts nearly in line transversely; a few long black hairs at the extremities. Thick tufts of plumed hairs, black-brown from warts I and II on joint 5; divergent black pencils from the closely approximate warts I and II on joint 12; dense shorter white tufts from I and II on joints 3 and 4, III on 5, I to III on 6, a few hairs from III on 9 or 9 and 10, moderate from III on 12, a few hairs from wart III on 13.

Stage VII.—Head whitish brown, a black line at the edge of the clypeus and a patch before the eyes. Body marked as before, but the narrow yellowish dorsal line runs through a series of velvety brown patches; the pale bands may be yellow or red. Warts all pale; spiracles white with black rims. Wart I bears some stiff bristles; long hairs from the extremities; lateral hairs soft, barbuled, mixed with stiff bristles. Tufts all fine, light pinkish brown, like the color of new leather; those from warts I and II on joints 5 and 12 a little darker in shade. There are small tufts from warts III on joints 7 to 10. Venter and feet pale. In another example the white and black tufts persisted in the last stage. Another larva had but six stages with the following widths of head: 0.35, 0.6, 1.0, 1.9, 3.0, and 4.8 mm.

Cocoon.—Formed between leaves, composed entirely of silk, firm.

Pupa.—Cylindrical, the posterior fixed abdominal segments abruptly tapering; posterior margins of the segments with smooth, shining, slightly elevated rims. All coarsely wrinkled, the abdominal segments in front thickly covered with large conical elevations; cremaster tapering, concolorous, with a bunch of dense, numerous, stiff bristles projecting backward. Color, blackish brown. Length, 18 mm.

Food plants.—Birch, apple, walnut, oak, willow, poplar, elm, choke cherry, cherry, linden, ash.

ACRONYCTA SPERATA Grote.

(Plates II, fig. 6, adult; VIII, figs. 31, 32, larva; XXII, fig. 3, male genitalia.)

Acronycta sperata Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 81, pl. II, fig. 1.
Arctomyscis sperata Grote, Papilio, 1883, III, p. 113.
Pharetra sperata Grote, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color a dirty, powdery ash gray. Head and thorax without definite markings. Primaries, with all the markings, smoky and rather obscurely defined. Basal line geminate, marked on the costa only.

Transverse anterior line geminate, slightly outcurved as a whole, and a little outcurved between the veins. The median shade line is distinct in most of the specimens and almost upright, crossing the wing near its middle, and a little bent outwardly on the median vein. Beyond it the median space is usually darker than toward the base. Transverse posterior line geminate, the inner line vague, the included space a little paler; the outer line more or less lunulated, often broken entirely, a little sinuate, and nearly parallel with the outer margin. There is a broken, pale subterminal line, beyond which the terminal space is shaded with smoky spots which do not reach the outer margin. There is a broken terminal line, and the fringes are cut with smoky. There are no streaks or dashes. The ordinary spots are distinct, darker, and rather contrasting. The orbicular is smaller, moderate, black-ringed; the reniform is large, kidney-shaped, incompletely outlined, but dusky filled. The secondaries are white in the male; outwardly a little soiled in the female. Beneath whitish, more or less powdered, the secondaries sometimes with a discal spot and traces of an outer line.

Expanse, 1.20 to 1.40 inches (30 to 35 mm.).

Habitat.—Canada to District of Columbia; west to Illinois; Missouri; Colorado (?); Massachusetts in May and June; central New York, May and June; Illinois in May.

In my catalogue I have recorded the species from the Northern States, May to August; but the specimens now before me do not show so great a range.

The species is quite easily recognizable by the pale, dirty gray primaries, in which all the markings are obscure, and only the ordinary spots stand out in dusky relief, contrasting with the clear white secondaries of the male, which are only a little soiled in the female. The front of the head is flat, the palpi reaching scarcely to the middle of the front. The anterior leg of the male has the femur rather dilated at middle, abruptly narrowed to the tip. The tibia is stout and proportionately rather short, while the tarsi are long and slender. The epiphysis is situated at the middle of the tibia or a little above, and does not extend to the tip.

The only variation that occurs in the species, so far as it is represented in the specimens before me, is that sometimes the wing beyond the median shade is darker than it is toward the base, and sometimes there is no apparent difference. The harpes of the male are broad and rather short, a little acutely rounded at the tip. The clasper has the inferior process almost as long as the superior. The superior process is rather stout, reaching nearly to the tip of the harpes, and only a little curved; the inferior process is almost as long, acute at the tip, and a little curved.

LARVA.

PACKARD, Fifth Rept. U. S. Comm., 1890, p. 628 (*Apatela* sp.).

Stage VII.—Head slightly bilobed, shining red brown, the sidepieces of clypeus yellowish; width, 2.8 mm. Body slightly enlarged at joint

12, wart IV small. Pinkish or creamy brown, more or less mottled with blackish shades, especially in a broken dorsal band, segmentarily furcate, between warts II and III and around the spiracles. A red substigmatal band, sometimes scarcely defined from the general reddish color. Hairs bristly, light red, brighter on joint 5; a few long ones at the extremities, and tufts of short, fine, feathery whitish hairs from warts I to III, on joints 6 to 12, more or less abundant. Another example was heavily shaded with black, the hair still red, the red substigmatal line and a series of subdorsal patches retaining the usual color. Head brown black.

Cocoon.—Spun between leaves partly bitten up into little patches, elliptical, thin, single, composed of pale silk.

Pupa.—Dark brown, a little blackish dorsally; fixed abdominal segments tapering; segments coarsely pointed, granular above; quite smooth in a narrow posterior rim. Thorax and cases wrinkly. Cremaster rather long, narrow, conic, smooth, terminating in a dense, round tuft of bristles.

Food plants.—Poplar, alder.

ACRONYCTA NOCTIVAGA Grote.

(Plates I, fig. 11, adult; VIII, figs. 27, 28, larva; XVIII, fig. 21, leg; XXII, fig. 6, male genitalia.)

Acronycta noctivaga GROTE, Proc. Ent. Soc. Phila., 1864, II, p. 437, pl. IX, fig. 3.—BETHUNE, Can. Ent., 1869, I, p. 71.

Apatela noctivaga PACKARD, Forest Insects, 1890, p. 460.

Pharetra noctivaga GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Acronycta longa WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 60.—GROTE and ROBINSON, Trans. Am. Ent. Soc., 1868, II, p. 77, pr. syn.—BUTLER, Ent. Amer., 1887, III, p. 36, pr. syn.

Ground color white or nearly so, overlaid by black scales, and mottled so as to give the insect a somewhat marbled appearance. Head irregularly mottled with black, usually with a distinct line across the front. Collar with the upper half black. Thorax with patagiae black marked, and the disk strongly black powdered. The wings have the ordinary markings fairly evident, but confused by the irregular black suffusion. The basal line is geminate and black, included space white. Transverse anterior line geminate, black, outwardly oblique, strongly outcurved between the veins, the included space white. The entire basal space is black powdered, but below the middle it is entirely suffused by blackish scales, so that there seems a contrast between the upper and lower part. The median shade line is diffuse, starting obliquely from the costa across the reniform, and below this running parallel to the transverse posterior line. The transverse posterior line is geminate, black, the inner line lunulate, the outer merged into the black subterminal space, the included space white, evenly sinuate, with two strong outward teeth on veins 3 and 4. The subterminal line is white, broken, defined by the black subterminal space and by a series of interspacial black spots in the terminal space. There is a series of black terminal spots, preceded by a white terminal line, the fringes being cut with black. The ordinary spots are distinct, darker than the rest of the wing. The orbicular is small or moderate in size, round, black ringed, and usually with a dark center, which, as a rule, fills the entire space. The reniform is large, indefinitely outlined, kidney-shaped, and filled with black. Beyond the transverse anterior line a black patch extends to the median shade just above the submedian vein. Just above the anal angle a black patch extends from the transverse posterior line to the outer margin. Secondaries smoky, paler in the male, more yellowish in the female, with a slight brassy reflection. Beneath yellowish, powdery, with a more or less broken outer line and discal spot.

Expanse, 1.32 to 1.50 inches (33 to 37 mm.).

Habitat.—Canada, Jun to August; Massachusetts and New York, May and June; Washington, District of Columbia, in May; central Illinois, July 17; New Mexico; Portland, Oregon, April and May; Colorado.

The species is widely distributed and probably occurs over nearly the entire United States. A specimen before me, not in the best condition, from New Mexico, indicates that possibly there may be a similar representative species from that region. It is easy to recognize this insect by the very strong contrast between the white ground color and the black lines and blotches, which give it a striking appearance. There is little variation except in the extent of the black blotching. The front of the head is slightly convex, the head itself a little retracted; the palpi distinct and reaching to about the middle of the front. The anterior leg of the male has the femur well developed, rather evenly enlarged toward the base; the tibia stout, with the epiphysis short, inserted below the middle and reaching to the tip. The harpes are moderate, obliquely rounded at tip; the clasper, arising from an oblique ridge, is single, pointed at the tip, and a little curved. There is a very slight indication of an inferior process, but practically we have a single curved hook.

LARVA.

Thaxter, Papilio, 1883, III, p. 15.—Packard, Fifth Rept. U. S. Ent. Comm., 1890, p. 460.

Stage I.—"Head brown; body rather stout, not tapering, greenish white; dorsal portion of joints 2, 5, 8, 9, and 12 red, the rest more or less tinged with red, sparsely clothed with long blackish hairs." (Thaxter.)

Stage II.—"Head dirty red, greenish anteriorily; body dirty greenish; segments distinct; dorsal patches dull reddish on superior portion, the other segments, except 10 and 11, suffused with red, somewhat thickly covered with tufts of stout black hairs." (Thaxter.)

Stage III.—"Head dark blackish; joint 12 enlarged; much darker than before, the red color becoming dark wine color, somewhat thickly mottled and suffused over the dorsal portion of all the segments except 10 and 11. Sublateral and ventral portion light green, except on segments 2 and 4, which are tinged with red. A whitish lateral line. Warts black, hairs stout, black; those on joint 11 shorter than the others." (Thaxter.)

Stage IV.—"Head blackish, with a yellow V-shaped mark; body dull black above, yellowish beneath; a yellow lateral (subventral) line. The yellowish dorsal (subdorsal) patches on joint 11 on which the hairs are short. Joints 3–5 and 12 hunched up." (Thaxter.)

Stage V.—"Black above, deeper anteriorily. A distinct yellow band beginning on joint 5, running just below the stigmata, which are white, contrasting. Feet yellow, prolegs black; dorsal patches on joint 12 brighter; otherwise as before." (Thaxter.)

Stage VI.—Subventral "band orange colored; a broken yellowish stripe on the base of legs; two (sub) dorsal orange spots on joint 11 and sometimes a pair on joint 10." (Thaxter.)

Stage VII.—Head slightly bilobed, shining brown-black, sutures of clypeus, labrum, and antennae whitish; width, 3.3 mm. Body dull black, obscurely shaded and mottled. A broad obscure, diffuse, red substigmatal band (V) and a faint spot on joint 11 in front of wart I. Warts large, hair bristly and blackish from warts I to III, softer from IV to VI; wart IV very small; tufts of fine feathery hairs from warts I to III on joints 5 to 10 and 12, dark gray, in some examples so few as to be hardly noticeable.

Cocoon.—"Between leaves." (Thaxter.)

Food plants.—Poplar; also various low plants.

ACRONYCTA EMACULATA, new species.

(Plates XIII, fig. 2, male adult; XXII, fig. 9, male genitalia.)

Ground color a bluish ash gray. which is almost entirely overlaid by smoky scales, particularly in the female. The head and thorax are strongly powdered with smoky and black, without forming distinct markings. Primaries with all the markings traceable, but hardly prominent. Basal line geminate, black. Transverse anterior line geminate, the outer line black, the inner smoky, almost upright, as a whole a little outcurved between the veins. Median shade almost upright, a little oblique from the costa through the reniform, and then close to the transverse posterior line to the inner margin. The transverse posterior line is geminate; the inner line smoky, the outer black and a little dentate on the veins, included space of the palest ground color. As a whole the line is rather squarely bent over the cell, and strongly incurved below. Beyond this curve is a dusky shading, and the subterminal space as a whole is a little darker than the rest of the wing. Subterminal line whitish, broken, irregularly followed by black marks in the interspaces. There is a series of terminal black marks, and the fringes are cut with dusky beyond them. There is a somewhat indefined basal black streak, below which the space is blackish. An oblique black mark extends from the transverse anterior line to the median shade just above vein 1. The ordinary spots are not well marked, though visible. The orbicular is round, moderate in size, ringed with black scales, and with a smoky center. The reniform is large, kidney-shaped, smoky. The secondaries are soiled whitish in the male, smoky in the female.

Expanse, 1.32 to 1.40 inches (33 to 35 mm.).

Habitat.—Calgary, Canada; Easton, Washington.

I have only two specimens of this species. The male, a very good specimen from Calgary, received from Mr. Dod; the female, evidently an electric-light capture, because one secondary is scorched, taken by Mr. Koebele and belonging to the U. S. National Museum, and these are the types. The female is very much darker than the male and the markings are hardly relieved. The male might pass as a very dark *impressa*, but the female shows more resemblance to *sperata*. In fact, the male itself would be more readily considered a variety of *sperata* than of *impressa*, though when the markings are closely compared the resemblance is to *impressa*. In the male characters this resemblance is intensified, because there is practically no difference in the genitalia, nor, indeed, in the leg structure. Nevertheless, I believe this to be a good species from the characters above given.

ACRONYCTA IMPRESSA Walker.

(Plates I, fig. 12, adult; VIII, figs. 33, 34, larva; XIII, figs. 4, 5, male and female adult; XIV, fig. 9, thorax; XVIII, fig. 19, leg; XXII, figs. 10, 11, male genitalia.)

Acronycta impressa WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 61.—GROTE, Ill. Essay, 1882, p. 38=*brumosa* Grote.—BUTLER, Ent. Amer., 1887, III, p. 35, an sp. dist. *brumosa* Guénée.

Pharetra impressa GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Acronycta fasciata WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 62.—GROTE, Ill. Essay, 1882, p. 39=*brumosa* Grote.—BUTLER, Ent. Amer., 1887, III, p. 35=*impressa*.

Acronycta brumosa GROTE, in lists and coll.—SPEYER, Stett. Ent. Zeit., 1875, XXXVI, p. 109.—BUTLER, Ent. Amer., 1887, III, p. 35=*impressa*.

Apatela brumosa ‡ PACKARD, Forest Insects, 1890, p. 169.

Acronycta verrillii GROTE and ROBINSON, Trans. Am. Ent. Soc., 1870, III, p. 178, pl. II, fig. 82.—MORRISON, Can. Ent., 1875, VII, p. 79=*innotata*; Ann. Lyc. Nat. Hist., N. Y., 1875, XI, p. 92=*brumosa*; Psyche, 1875, I, p. 42=*brumosa*.

Ground color a somewhat dirty ashen gray, more or less black powdered. Head with a dusky line on the front, and usually another on the vertex. Collar tipped with black or smoky, although this is inconstant. Patagiae more or less black margined, and the disk also irregularly powdered. The primaries have the ordinary markings distinct. Basal line geminate, black; transverse anterior line geminate, smoky or blackish, more or less interrupted, outcurved in the interspaces, as a whole a very little oblique. The median line is more or less obscured when best marked, a little oblique from the costa, darkening the reniform and below it running rather close to and parallel with the transverse posterior line. Transverse posterior line geminate, the inner line smoky and rarely complete, the outer line black, irregular, more strongly dentate on veins 3 and 4. As a whole it is somewhat S-shaped. There is an outward tooth in the submedian interspace in most of the specimens. Subterminal line interrupted, irregular, pale, marked by black scales in the interspaces. There is a series of terminal spots, beyond which the fringes are cut with black. There is a more or less evident black streak, which is generally interrupted at the base, and below this the basal space is darkened by black powderings. A more or less obvious smoky shading extends above vein one to the median line, though the tendency in this species is to lose its shading. The inward curve of the transverse posterior line above the anal angle is followed by a dusky shading which usually extends only to the subterminal line, but sometimes reaches the outer margin. As a whole the subterminal space is somewhat smoky filled. The ordinary spots are distinct; the orbicular small, round, black ringed, with a central dusky dot; the reniform large, kidney-shaped, somewhat incompletely outlined and with a smoky center. Secondaries yellowish white in the male, more smoky in the female. Beneath whitish, more or less powdery, in the female with a distinctly smoky tinge. Discal spot obvious on the secondaries, less distinct and sometimes wanting on the primaries; rarely with a traceable exterior line, except on the secondaries.

Expanse, 1.20 to 1.50 inches (30 to 37 mm.).

Habitat.—United States, west to the Rocky Mountains, Canada, May to August; central New York, July and August; Minnesota in June; central Illinois in July; New Jersey, July 17; Washington, District of Columbia, in May; Glenwood Springs, Colorado, in August.

The synonymy of this species as above given is, I believe, correct. Except in the case of Mr. Grote's species I have not seen the type; but Mr. Butler has definitely referred *impressa* and *fasciata* as being the same, while Mr. Grote has referred *fasciata* as the species identified by him as *brumosa*. The discussion concerning this species will be found under the next heading.

LARVA.

LINTNER, Twenty-sixth Rept. N. Y. State Mus., 1874, p. 159 (*oblinita*).—COQUILLETT, Papilio, 1881, I, p. 56 (*brumosa*).—DIMMOCK, Psyche ,1885, IV, p. 274.—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 169.

Stage VII.—Head shining black, without marks; width, 2.8 mm. Body velvety black, a broad diffuse, faint reddish substigmatal stripe (V and VI). Warts pale, sometimes whitish on the central segments, hair short, in small bunches from the warts, dorsal space appearing black from the absence of hair. On joints 3 to 5 and 12–13 the hairs are somewhat spiny and light reddish brown; elsewhere soft and pale yellowish. A few long ones at the extremities; wart IV very small.

Cocoon.—Spun tightly among leaves; composed of silk.

Pupa.—Brown-black, cases heavily wrinkled, abdominal segments roughened with irregular confluent granules, not points, the rounded posterior segmental bands smooth. Anal segments rapidly tapering. Cremaster wide, flattened, concave below and with a dense brush of little straight spines over the end.

Food plants.—Willow, plum, hazel, currant, blackberry.

ACRONYCTA DISTANS Grote.

(Plates XIII, figs. 6, 7, male and female adults; XVIII, fig. 20, leg; XXII, figs. 12, 13, male genitalia.)

Apatela distans GROTE, Can. Ent., 1879, XI, p. 58.

A detailed description of this species would be in all essential points a reproduction of what was written under the head of *impressa*, the two look so much alike. *Distans*, as compared with *impressa*, is, on the whole, a trifle smaller. The wings, especially in the male, are narrower and the apices of the primaries are distinctly more pointed. The latter is particularly true of the female, but is also traceable in the male. The markings, on the whole, are less distinct, more suffused by black scales, and there is a dusky or blackish longitudinal shading, which extends from the base below the middle of the wing to the outer margin without a distinct break. This is perhaps the most obvious character of the species; but it is a somewhat variable one, and occasionally a break occurs just inside of the transverse posterior line, and then the resemblance to *impressa* becomes very close. On the whole the species has the secondaries a little paler than in the previous case, but otherwise the two resemble each other perfectly. I doubt whether I would have considered this a distinct species had not Dr. Dyar called my attention to the fact that there seemed to be a larval difference. When the forms are separated in series a difference may be marked; but a single specimen may be troublesome to place in some cases. The species is perhaps better defined in the female than in the male. In the sexual characters there is very little difference; in both cases the harpes are rather evenly rounded at the tip and the clasper is very well developed and large. The inferior process is long, somewhat excavated on the inner side, with a rounded tip; the superior process is stout, long, nearly equal to the tip, where it ends in an abrupt, short point. In *impressa* this upper process is nearly straight and somewhat irregular; in *distans* it is more even and distinctly curved, though not strongly so. The differences, however, are comparative, and I would not be inclined to give them much weight. There is more difference in the anterior legs of the male. These in *distans* are distinctly longer than in *impressa*, not only comparatively but absolutely, though *distans* is the smaller species. The tibia in *impressa* is distinctly stouter and the epiphysis is inserted nearer to the base, besides being also broader. I have not been able to discover any other characters. I have not seen

Mr. Grote's type; but his description evidently refers to a specimen in which the longitudinal shading through the inferior portion of the wing is well marked. So far as distribution is concerned and the dates of appearance, these seem to be the same in the two species.

These are perhaps the most closely allied of any of the species in the genus, and they are mixed in collections generally. It is very probable that all previous authors have confused the two; but Mr. Grote's description, being defined, must be applied to the form agreeing with it.

LARVA.

SAUNDERS, Ins. Inj. Fruits, 1881, p. 313 (*brumosa*); Rept. Ent. Soc. Ont., 1883, p. 12 (*brumosa*).—PACKARD, Fifth Rept. U. S. Ent. Comm., 1890, p. 498 (species 43, birch).

Stage VI.—Head shining black; width, 2 mm. Body black, pale in the incisures; a substigmatal yellowish band, diffuse below. Hairs rather stiff throughout, a few long ones at the extremities; all pale yellowish except some black ones from warts I and II on joints 5 and 12.

Stage VII.—Head shining black, no marks; width, 2.5 mm. Body black, paler in the incisures, with the substigmatal band as before. Hair short, in small bunches from the warts, dorsal space appearing somewhat broadly black from the absence of hairs. Hair pale yellow, soft, a few bristly ones from tubercle I and some black ones on joints 5 and 12.

Cocoon.—Spun tightly among leaves; composed of silk.

Pupa.—Like that of *A. impressa* exactly.

Food plants.—Poplar, willow, birch, alder.

ACRONYCTA BARNESII, new species.

(Plates XIII, fig. 10, male adult; XXII, fig. 15, male genitalia.)

Ground color dark ashen-gray, very strongly powdered with black. Head without distinct markings, though there is a tendency to become black on the vertex. The patagiae are black margined, and the disc also tends to become more or less black lined. The primaries have all the ordinary markings obscured and tend to become strigate. The transverse anterior line may be traced, in some specimens, across the entire wing. It is black, geminate, the outer portion being the more evident. As a rule it consists of a pair of oblique streaks from the costa toward the middle of the wing. The median shade is marked in the same way, as a single streak from the costa toward the faintly indicated reniform. The transverse posterior line is barely indicated in some specimens; but usually wanting altogether. There is no subterminal line; but a vague paler shading may be traced, parallel with the outer margins, in some specimens. There is a series of black terminal spots, beyond which the fringes are prominently cut with black, and from these spots a series of rays extend inward; that above vein 5 being the longest and most prominent; the others lessening toward the apex. There is a broad black streak, extending from the base to beyond the middle of the wing in the submedian interspace. There is another, which almost fills the space between veins 1 and 2, and extends from the median vein to the outer margin. The other interspaces are less prominently black filled; but sometimes the powdering obscures these rays, and the whole wing gets an indefinite mottled appearance. The ordinary spots are wanting or very faintly indicated; the orbicular is not present in any specimen before me; the reniform is small, somewhat lunulate, and incompletely outlined in all but two of the nine examples under examination. Secondaries white in the male, smoky in the female. In both cases with a darker terminal line. Beneath white in the male, smoky in the female; powdery, with a more or less marked discal spot and sometimes a trace of an outer line.

Expanse, 1.50 to 1.84 inches (37 to 46 mm.).

Habitat.—Colorado: Denver; Garfield County, 7,000 feet; Glenwood Springs, June and July.

All the specimens before me were collected by Mr. David Bruce or by Dr. William Barnes. There are six males and three females, the latter being the larger throughout. Types are in the U. S. National Museum, Rutgers College, and with Dr. Barnes and Mr. E. L. Graef. The only variation that occurs is in the amount of the black powdering through the wings; otherwise it is very constant. The species has been confused with *edolata*, than which it has broader, more trigonate wings and a paler ground color. The head is moderate in size, the front just a little bulging; the palpi well developed and reaching to the middle. The legs are rather long in the male, with the femur evenly developed, not particularly stout in the middle; the tibia is proportionate, with the epiphysis inserted above the middle and not reaching to the tip. The harpes are rather short and broad, quite evenly rounded at the tip. The clasper has the inferior process well developed, rather long and somewhat beak-like; the upper process of moderate length, more slender and well curved; it is not more than one and one-half times as long as the inferior process.

ACRONYCTA PERDITA Grote.

(Plates III, fig. 6, adult; XVIII, fig. 16, leg; XXII, fig. 16, male genitalia.)

Acronycta perdita GROTE, Can. Ent., 1874, VI, p. 151.

Ground color a very dark bluish gray, the wings strongly suffused with black. Head blackish on the vertex. Collar, centrally black, the sides being gray. The patagiae are black margined, while the disc has a black line on each side and sometimes also in the center. The primaries, although thoroughly suffused with black, still admit of tracing all the ordinary markings. The basal line is very feebly indicated by a pair of black dots on the costa. The transverse anterior line is geminate, strongly bent outwardly between the veins; as a whole nearly upright. It is not complete in any of the specimens before me, but is always obvious on the costa at any rate. The median shade is traceable from the costa through the reniform as a somewhat diffuse black shade. The transverse posterior line is usually well marked, strongly dentate on the veins, particularly on 3 and 4; it is geminate, the outer line lunulate, the inner more even and broken; it is rarely complete. The subterminal line is broken, pale, consisting of rather a series of shades than a real line. The terminal space is marked by a series of black spots, separated by the paler veins. There is a series of black terminal dots, beyond which the fringes are cut with black. The ordinary spots are traceable. The orbicular is round or nearly so, small, defined by black scales. The reniform is large, indefinite, dusky. As a whole the lower portion of the wing is darker than the upper because of a black shade which extends from the base through the median space below vein 2. It may or may not be cut by the transverse posterior line, and beyond it this shade reaches to the outer margin, extending upward to vein 3. A somewhat triangular patch extends from the transverse posterior line to the outer margin opposite the cell. Above this the space between the transverse posterior and the subterminal line is black. The veins are generally a little paler, so that the wings have a rayed appearance. Secondaries white in the male, with a discal spot and an outer, smoky margin. In the female they are smoky. Beneath, white in the male, smoky in the female; both wings with a discal spot, but with only a faint trace of an outer line.

Expanse, 1.40 to 1.68 inches (35 to 42 mm.).

Habitat.—Sierra Nevada, California, in June; Easton, Washington.

This species varies little in the series before me, except in size. The females are as a whole larger than the males, but the difference is not great. There is some difference in the amount of black in the wings, and this determines the distinctness with which the markings appear. This type seems to be an intensification of the characters found in *barnesii*, but with the transverse lines much better marked. The legs of the male are longer; the femur is graceful, the thickest portion toward the base; the tibia is proportionately longer, with the epiphysis set at the middle and not reaching to the tip. The harpes of the male are evenly rounded at the tip. The clasper has the upper and lower process of nearly equal length; both being curved, but the lower is acute at tip and somewhat beak-like, while the upper is cylindrical, blunt at tip and rather more claw-like. The species is a distinct one in all its characters.

ACRONYCTA EDOLATA Grote.

(Plates IV, fig. 1, adult; XVIII, fig. 17, leg; XXII, fig. 17, male genitalia.)

Apatela edolata GROTE, Papilio, 1881, I, p. 153.
Mastiphanes edolata GROTE, Ill. Essay, 1882, p. 49, pl. I, fig. 4.

Ground color a very dark bluish gray, strongly overlaid by black scales. Head blackish above; collar blackish in the center, leaving the sides gray; patagiae black margined, the disk with black lines at the side, and a smoky line through the middle. The primaries have all the markings obscured by the black streakings, but somewhat traceable. The basal line consists of an oblique black streak across the costal space. The median shade is scarcely more. The transverse posterior line may be traced across the wing as a series of strongly dentate whitish points, followed by black, defining spots. There is nothing that can be called a subterminal line; but there is a pale shading, beyond which a series of black rays extend through the terminal space. Some of these rays cross the shading and extend inward to the transverse posterior line. Between veins 1 and 2, and 2 and 3, this line is actually crossed, and connection is made with the dusky shading which extends to the base below the median vein. The veins themselves are a little white marked. Secondaries white in the male, a little dusky outwardly; hardly darker in the female, but with a broader dusky margin. Beneath powdery white, a little darker in the female, with a more or less obvious discal spot; but no outer line in any of the specimens before me.

Expanse, 1.72 to 1.88 inches (43 to 47 mm.).

Habitat.—Arizona.

This is a narrow winged species in which the primaries tend a little to become lanceolate. The ordinary markings are all much obscured, the dentate transverse posterior line being the only thing that is at all traceable, and this is very characteristic. The ordinary spots are not traceable in any specimen before me. The Colorado locality given in my catalogue is probably an error, due to the fact that specimens of *barnesii* were confused with this species. The head is of good size; the front a little convex, but not bulging; the palpi reach to the middle of the front. The anterior legs of the male are fairly well developed; the tibia rather stout and long in proportion to the femur, with the epiphysis inserted a little below the middle and reaching to the tip. The harpes of the male are moderate, rather evenly rounded at the tip. The clasper is stout, the inferior projection short and beak-like, the upper process forming a long curved hook, which gradually narrows to the pointed tip. The upper process is more than twice as long as the lower.

ACRONYCTA EXTRICATA Grote.

(Plates XIII, fig. 9, female adult; XVIII, fig. 15, leg; XXII, fig. 18, male genitalia.)

Apatela extricata GROTE, Bull. U. S. Geol. Surv., 1882, VI, p. 575.
Mastiphanes extricata GROTE, Papilio, 1883, III, p. 113.

Ground color dark bluish gray, powdery, with more or less evident smoky shadings. Head with vertex smoky; collar smoky or rusty brown above. The patagiae with narrow smoky margins and the disk with a smoky line on each side. Primaries with the transverse markings obscured in most specimens. Basal line marked by an oblique black dash on the costa. Transverse anterior line fragmentary, in most cases only a strongly dentate brown shading; but in some instances a part of the line is marked with black. The median shade is usually pretty well marked and smoky brown. It is outwardly oblique from the costa through the reniform, then bends inwardly and runs nearly to the middle of the inner margin. The transverse posterior line is strongly dentate, obscurely geminate, the outer portion of the line black, the intervening space very pale, while the inner defining line is smoky if at all traceable. There is an obvious subterminal line. There is a series of terminal dashes between the veins, which extend inwardly to the transverse posterior line between veins 4 and 5, and 5 and 6. Other dashes extend inward above and below vein 1. There is a black basal streak, which extends well to the middle of the wing and nearly meets one of the inward dashes below vein 2. The ordinary spots are obscure, imperfectly outlined; the orbicular a little elongate; the reniform small, incompletely defined, outwardly smoky. Beyond the median shade the space between the veins is more or less marked by short black dashes. Secondaries white, a little soiled toward the apex in the female. Beneath white, powdery, usually without trace of any outer line or discal spot, although in some specimens the spot at least is indicated.

Expanse, 1.72 to 1.80 inches (43 to 45 mm.).

Habitat.—Texas, in March, May, and August.

This species is rather well marked and not easily mistaken for anything else. The wing seems strigate, an appearance which is enhanced by the narrow primaries and the strongly dentate transverse posterior line. In most of the specimens the median line is distinct and angulated, and in some examples it is very prominent. Occasionally it is traceable only with some difficulty, and in that case the species may be separated from *xyliniformis*, which it resembles, by its larger size, more strigate appearance, by the strongly dentate transverse posterior line, and by the basal black streak. The legs are long and stout, the anterior femur of the male dilated toward base; the tibia unusually stout, with the epiphysis attached above the middle and reaching to the tip. The tarsi are complete, short, and stout. The harpes of the male are a little oblique at tip, quite evenly rounded. The lower, beak-like process of the clasper is very stout and rather short; the upper, hook-like process is quite long, stout, and moderately curved. The species has not been found except in Texas thus far, and does not seem to be a common form there.

ACRONYCTA XYLINIFORMIS Guenée.

(Plates IV, figs. 5, 10, 12, 15, adults; VIII, fig. 35, larva; XV, figs. 14, 20, head; XVIII, fig. 14, leg; XXII, fig. 19, male genitalia.)

Acronycta xylinoides GUENÉE, Spec. Gen., Noct., 1852, I, p. 56.—GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 81, note 11.

Acronycta xyliniformis GUENÉE, Spec. Gen., Noct., 1852, III, p. 400.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 60.

Apatela xyliniformis DIMMOCK, Psyche, 1885, IV, p. 274.
Arctomyscis xyliniformis GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.
Acronycta longa GUENÉE, Spec. Gen., Noct., 1852, I, p. 54.—BETHUNE, Can. Ent., 1869, I, p. 71.—BUTLER, Ent. Amer., 1887, III, p. 36 = *brumosa* Guenée.
Apatela spinigera ‡ GROTE, in lists and coll.—THAXTER, Psyche, 1878, II, p. 121.—GROTE, Bull. U. S. Geol. Surv., 1883, VI, p. 572.—DIMMOCK, Psyche, 1885, IV, p. 274, larva.
Apatela pallidicoma GROTE, Bull. U. S. Geol. Surv., 1878, IV, p. 169.
Pharetra pallidicoma GROTE, Mitth. a. d. Roem. Mus., Hildesh., No. 3, 1896, p. 7.

Ground color ashen gray, more or less black powdered. Head and thorax without definite markings, though the patagiae are sometimes a little dusky. Primaries with the markings fairly well defined. Basal line obscurely marked on the costa, and in most cases wanting. Transverse anterior line geminate, a little oblique, strongly outcurved between the veins, smoky, rarely entirely complete, and more frequently marked only by an oblique costal dash, everything below that being barely indicated or entirely wanting. The median shade is marked by an oblique streak from the costa to the reniform, and is sometimes traceable as a smoky shading obliquely inward from that point; as a rule, however, it is not traceable. The transverse posterior line is obsoletely geminate, the inner line very faintly marked, the intervening space whitish, the outer line black, lunulate, and a little dentate on the veins. Beyond this the subterminal space is somewhat darker, and occasionally relieves a vague shading that may be looked upon as a pale subterminal line. There is a series of black dots, beyond which the fringes are cut with black, and from which smoky or blackish shadings sometimes extend inwardly. There is no black longitudinal line or streak at base, though sometimes a few black scales indicate such a mark. There is a distinct dagger mark crossing the transverse posterior line in the submedian interspace. The ordinary spots are fairly well defined; the orbicular small, round, with a dusky center or entirely dusky; reniform large, incompletely outlined, smoky or blackish, kidney shaped. Secondaries white in the male, more or less smoky in the female. Beneath white or smoky, powdery, with a more or less obvious discal spot, which is often wanting, and sometimes with a trace of an outer line.

Expanse, 1.40 to 1.80 inches (35 to 45 mm.).

Habitat.—Canada to Florida, west to the Rocky Mountains; Florida in March; Texas in March and August; central New York in July; central Illinois in July; Washington, District of Columbia, May and July.

This is an exceedingly variable species in size, ground color, and in the distinctness of the markings. It has received several names, Guenée describing it twice, for I have no doubt, from the description, that *longa* was indicated for a form of this species. Mr. Grote has named one form *pallidicoma*, and has identified another as *spinigera* in collections. All these forms are referable to one variable type, which is rather easily identified by the fact that there is no distinct basal streak. This associates it with the narrow-winged forms like *oblinita* and *lan-*

ceolaria, neither of which it resembles enough to be mistaken. It seemed at first as if two species might be separated out; but I was absolutely unable to find any characters that were at all permanent. The head is distinct; the front a little convex, but hardly bulging; the palpi distinct, scarcely reaching the middle of the front. The anterior legs of the male are rather slender and graceful, the femur only a little thickened, the tibia well developed, the epiphysis inserted above the middle and reaching nearly to the tip. The tarsi are rather long. The harpes of the male narrow rather abruptly. The clasper is distinct, the inferior process very short and abruptly pointed, the upper long, rather stout, usually obtuse at tip, and a little curved.

LARVA.

Riley, Fifth Rept. Ins. Mo., 1873 (*xyliniformis*).—Thaxter, Psyche, 1878, II, p. 121 (*spinigera*); Papilio, 1883, III, p. 17.

Stage II.—Head bilobed, shining whitish, with brown shades below the apices of the lobes; width, 0.5 mm. Body whitish, heavily shaded with dark brown in a subdorsal (I) and lateral (III) bands which join on joints 5, 8–9, and 12. Warts large, concolorous, with large bunches of stiff brownish hairs. Skin smooth.

Stage III.—Head as before; width, 0.6 mm. Body more heavily banded with brown, which is darker and blackish, leaving contrasting pale areas around wart II on joints 6, 7, 10, and 11; venter pale. Hair abundant, stiff, blackish.

Stage IV.—Head blackish, a paler spot below the apex of each lobe and on the side pieces of the clypeus, and over eye; width, 1 mm. Body as before, the dark marks more spreading and mottled. In pale examples the body is gray, finely blackish peppered, on a whitish ground, the white spaces of previous stage nearly obscured. Hair bristly, short, blackish, and whitish, a few long ones at the extremities.

Stage V.—Head brownish, with the side pieces of clypeus, a patch below apex of each lobe, and an irregular patch over the eye pale; width, 1.4 mm. Body gray, mottled, the warts black; faint paler marks around wart II on the central segments. Hair black and white, stiff.

Stage VI.—Head brownish black, paler on the sides and below the tops of the lobes, side pieces of clypeus whitish, forming an inverted V mark; width, 2.3 mm to 2.5 mm. Body gray, mottled, a darker dorsal shade; a series of whitish patches over warts I and II on joints 6 to 11. Warts dark, except in the pale patches; hair bristly, with sharp points, except the few long ones at the ends of the body and a few fine short hairs from warts I to III on joints 6 to 12, which are smooth, not barbuled.

Stage VII.—Head black, with pale V mark and labrum, or dull reddish shaded with brown, the V mark yellowish; width, 3.5 mm. Body varies from blackish to gray, finely strigose and peppered, a dorsal darker shade, faintly broken into segmentary furcate patches. A broad diffuse, red substigmatal band, most distinct in the paler form. Warts nearly in line transversely, IV nearly obsolete, yellowish, a more or less distinct yellowish patch covering warts I and II on joints 6 to 12. Hairs stiff and spiny, sharp pointed, with a few long, slender, black ones at the extremities. The spines are pale with black tip, a few black, and, in the darker forms, those on joints 3 to 5 are deep red at the base. From warts I to III on joints 6 to 10 are small tufts of dense, fluffy, barbuled, conspicuous, white hairs, but variable, in some examples being so few as to be not noticeable at once.

Pupa.—Posterior abdominal segments, rapidly tapering; coarsely roughened with irregular dark points, the posterior margins of the segments smooth, raised, hoop-like. Thorax finely wrinkled, but comparatively smooth. Cremaster a slight tapering prolongation, shallowly furcate, granular at the apex, with two short, stout, thick, conical spurs, one above the other, at the apex of each furcation. Length, 17 mm.

Food plants.—Birch, blackberry.

ACRONYCTA OBLINITA Smith and Abbot.

(Plates IV, figs. 6, 13, 14, adults; VIII, figs. 29, 30, larva; XIV, figs. 4, 10, body; XVIII, fig. 13, leg; XXII, fig. 20, male genitalia.)

Phalaena oblinita SMITH and ABBOT, Ins. Ga., 1797, II, p. 187, pl. XCIV.

Acronycta oblinita GUENÉE, Spec. Gen., Noct., 1852, I, p. 49.—WALKER, Cat. Brit. Mus., Het., 1856, IX, p. 58.

Eulonche oblinita GROTE, Papilio, 1883, III, p. 113; List N. A. Eupterotidae, etc., 1897, p. 15.

Apatela oblinita FERNALD, Stand. Nat. Hist., 1885, II, p. 452.—PACKARD, Forest Insects, 1890, p. 567, fig. 191.

Acronycta salicis HARRIS, Ent. Corresp., 1869, p. 314, fig. 44.

Ground color a very pale gray, almost white. Head and thorax without perceptible markings; but always more or less black powdered. Primaries powdery, with the markings all traceable; but tending to become strigate. Basal line geminate, powdery, marked on the costa only. Transverse anterior line geminate, very poorly defined, with very strong outcurves in the interspaces. The median line is marked by an oblique shade from the costa to the center of the reniform. The transverse posterior line is lunulate, strongly dentate on the veins, blackish, with whitish included shades, so that in some specimens the line seems to be white or nearly so, when the black lunules are not so well marked. There is a series of prominent black terminal dots. In some specimens there is a feebly marked black basal streak; but this is never complete, and is more usually wanting. There are no dagger marks. The ordinary spots are very obscure and scarcely defined. The orbicular is oval, ringed with black scales and of the ground color. The reniform is moderate in size, dusky, incompletely outlined, but marked with black spots. Secondaries white, in both sexes without markings except a broken terminal line. Beneath white, powdery, usually without trace of outer line or discal spot. There is a tendency, however, to a discal spot in the secondaries, and to a less marked extent on the primaries also.

Expanse, 1.60 to 2 inches (40 to 50 mm.).

Habitat.—Nova Scotia to Florida, west to the Rocky Mountains; May to August, in the more northern range; March to July, Washington, District of Columbia; Riley County, Kansas, in May.

This is perhaps the most common of the species of this genus, and the early stages have been described again and again in economic publications. There is very little variation. The specimens may be somewhat paler or somewhat darker, depending upon the amount of black powdering; but it can be scarcely mistaken for anything else, because of the narrow, sublanceolate primaries with the strigate maculations, and the pure white secondaries. The head is retracted, small in size, while the tongue is decidedly weaker than usual in the genus. The palpi are short, and scarcely reach to the front in most of the specimens. The anterior leg of the male is proportionately developed. The tibia is stout, long in proportion to the femur, with the epiphysis small and attached above the middle. The harpes of the male are rather broad, but taper to a rather abrupt point. The clasper consists of a single, long corneous process, pointed at the tip and a little curved. The lower part of the process is very feebly marked, and is indeed practically absent. The structure thus resembles that of the *americana* group, but for the fact that this starts from an oblique chitinous ridge, and from nearly the middle of the harpes, instead of starting directly from the membrane of the side piece near the lower margin. Strictly speaking, *oblinita* shows several interesting points of difference, and stands almost midway between the normal species belonging to group *auricoma* and *Arsilonche.* If the insect is to be removed from *Acronycta* it should find a place in the latter genus; but taking all considerations together, I think it is best left where it is; for the present at least.

LARVA.

SMITH and ABBOT, Lep. Ins. Ga., 1797, II, pl. XCIV.—GUENÉE, Spec. Gen., Noct., 1852, I, p. 49.—HARRIS, Ent. Corr., 1869, p. 314, fig. 44 (*salicis*).—PACKARD, Guide Stud. Ins., 1869, p. 304.—RILEY, Amer. Ent., 1871, II, p. 341, fig. 210; Third Mo. Rept., 1871, p. 70, figs. 29, 30.—SAUNDERS, Can. Ent., 1871, III, p. 226, fig.—GENTRY, Proc. Ac. Nat. Sci., Phila., 1875, p. 24.—GOODELL, Can. Ent., 1878, X, p. 66.—MARTEN, Tr. Dept. Agr., Ill., 1880, p. 18, 131.—GROTE, Papilio II, p. 99.—SAUNDERS, Ins. Inj. Fruits, 1883, p. 325, fig. 337.—PACKARD, Fifth Rept., U. S. Ent. Comm., 1890, p. 567.

Stage II.—Head black or brownish black; width, 0.5 mm. Body whitish, with a diffuse brown-black shade subdorsally and laterally, heaviest on joints 5, 8–9, and 12, leaving little white patches on the other segments. Venter shaded with brown. Hairs numerous, stiff, dusky black.

Stage III.—Head black; width, 0.7 mm. Body as before, but the brown shading is more extensive, covering the body except subdorsally on 6, 7, 10, and 11 in ring spots around warts II, in little streaks in the incisures and subventrally in a broad band which is narrowed at wart V and forms a series of intersegmental lunate patches. These marks are white. Hair black and white,, spiny.

Stage IV.—Head black, labrum pale; width, 1 mm. Body brown-black, slightly mottled with whitish, the subdorsal patches nearly absent, but the substigmatal band distinct as before. Hair mostly whitish, only a few dusky, stiff, bristly.

Stage V.—Head black; width 1.3 mm. Body as before.

Stage VI.—Head, 2.4 mm. Body brown-black, a little speckled with white, especially subdorsally; a broad substigmatal band of intersegmental lunate spots white. Warts black.

Stage VII.—Head scarcely bilobed, black; width, 3.7 mm. Body velvety black, mottled with yellow dots, which segregate into a series of irregularly shaped patches subdorsally on the posterior part of the segments and in the incisures. A broad, yellow stigmatal band, deeply incised at the spiracles and narrowly cut by wart V into a series of lunate patches on joints 2 to 12. Spiracles white. Warts black; hair short, bristly, a few long ones at the extremities and a very few fine short feathery hairs from warts I to III on joints 5 to 10. These feathery hairs may be absent and are never conspicuous. From this more generalized form there is a wide variation; the warts may be deep red, or situated in a series of broad, transverse red bands, reaching across to the spiracles on each segment. The yellow marks may be very much increased, the substigmatal band broadened and continuous, the subdorsal spots forming a continuous mottled stripe.

Cocoon.—Spun tightly among leaves; composed of silk.

Pupa.—Cylindrical, terminal abdominal segments rapidly tapering. Segments coarsely tubercular granular, except the smooth, raised posterior margin. Cases shagreened and grooved, nearly smooth. Color brown, not blackish. Cremaster flattened, broad, concave below, slightly tubercular, with a more distinct tubercle or short spine on each outer corner. Tuft of spines rather narrow, but fine; sparse, as if partly absent, not concealing the end of the cremaster.

Food plants.—Buttonbush, willow, alder, strawberry, raspberry, etc.

ACRONYCTA LANCEOLARIA Grote.

Apatela lanceolaria GROTE, Proc. Ac. Nat. Sci. Phila., 1875, p. 418.

Eulonche lanceolaria GROTE, Ill. Essay, 1882, p. 50, pl. I, fig. 7; Papilio, 1883, III, p. 113.

Ground color white or nearly so, very densely powdered with black, so that the insect obtains a bluish gray appearance. Head and thorax without distinct markings, but with a tendency to a dusky line on the patagiae. Primaries with all the markings obscured. The basal and transverse anterior lines are very feebly marked on the costa and sometimes entirely wanting. There is a bare indication of the median shade line in the shape of an oblique dusky streak on the costa. The transverse posterior line is fairly well indicated. It is single, blackish, a little lunulate, almost continuous, and is preceded by a pale shading. There is a vague blackish streak extending inward from the outer margin through the transverse posterior line in the submedian interspace. An oblique dusky shading begins opposite the cell and extends to just below the apex. This shading is made up principally of blackish streakings in the interspaces, which are longest between veins 3 and 4 and 4 and 5, and become rapidly shorter above. The orbicular is very faintly discernible as an indefined whitish mark. The reniform consists of an imperfect blackish lunule, a little marked by a paler shade. The secondaries are white. Beneath white, black powdered, without markings in the specimens before me.

Expanse, 1.80 to 2 inches (45 to 50 mm.).

Habitat.—Massachusetts, May, June, and August.

This insect can not be mistaken for anything else. The long, narrow, pointed wings, in which all the markings are washed out, are unmistakable. As compared with *oblinita*, its nearest ally, it is yet longer winged, as a whole larger in size, the ordinary markings almost entirely washed out, and only the transverse posterior line at all evident. Another point of interest is the absence of the terminal dots, which in *oblinita* are very prominent. Three specimens only are under examination, and all of these are, unfortunately, females. The head is retracted; the tongue often softer than in *oblinita.* The palpi are very small and weak, hardly reaching to the front.

LARVA.

Stage V.—"Head medium, smooth, flattened, greenish yellow, front black; two yellow lines above the clypeus, following its outline, meeting at the apex; a faint, horizontal, yellow mark below the clypeus. General color of upper surface pale yellowish green, stigmatal line yellow and raised. A tuft of diverging yellow hairs arises from each tubercle. Spiracles small, brown, oval. Under surface pale green, thickly mottled with brown. Feet black; legs pale green with a few white hairs. Length, 22 mm." (A. H. Kirkland, manuscript.)

Stage VI.—[Green] "Dorsal line black. Tubercles light green. Only white hairs found on the stigmatal row of tubercles. Feet and outside of prolegs black. The hairs on the sides of the body are longer than those elsewhere. Spiracles large, oval, surrounded by black. Length, 25 mm." (A. H. Kirkland.) Width of head, 3.6 mm.

Cocoon.—Spun between leaves, composed of tough, nearly white silk, rather thin but opaque. Shape, elongate elliptical, single.

Pupa.—Cylindrical, of nearly even width to the end of the movable segments, then rather sharply tapering. Thorax and cases wrinkly; dorsal abdominal segments with coarse, erect, blunt spine-like granules, except on a narrow, posterior, smooth, raised rim on each segment;

venter smoother, the segments hardly wrinkled, but with some fine punctures; posterior rim faint. Cremaster broad but short, hollowed below and grooved above, with a few deep coarse punctures before tip; a terminal bunch of numerous short bristles. Dark mahogany brown, not blackish. Length, 19.5; width, 6.5 mm.

Food Plants.—Willow, *Comptonia*, *Gaillardia*.

ACRONYCTA INSOLITA Grote.

Acronycta insolita GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 82.
Eulonche insolita GROTE, Papilio, 1883, III, p. 113.

"Resembles *A. oblinita* in the lanceolate primary wings, which are even longer and more produced apically. Blackish; orbits of the eyes white. Primaries uniformly blackish, the dark tone obscuring all ornamentation except the transverse posterior and subterminal lines, which are oblique and appear as rather broad interspaceal lunulated or squared gray marks, which, in the as usual flexed transverse posterior line are marked by black outward points, the fragments of the transverse terminal line itself, the gray marks being the preceding shade. Hind wings white beneath, with the costal region dusted with blackish scales. Palpi with the second joint outwardly black; fore tibiae with blackish longer hair. Abdomen whitish above, darker beneath, rather long. The unusually dark color and pointed wings, together with the peculiar appearance of the transverse lines, should make this species very recognizable. This last section of the genus reminds us of *Leucania*. My specimen of *A. insolita* expands 1.60 inches. Coll. Am. Ent. Soc."

This species is credited to "Pennsylvania" and later to the "Middle States." I marked it in my catalogue as in the British Museum, but have no notes nor remembrance of the insect. I have seen nothing in any collection accessible to me of any form agreeing with the above description; the only one of the genus with which I am not personally acquainted.

ACRONYCTA DENTATA Grote.

(Plate XIII, fig. 11, female adult.)

Apatela dentata GROTE, Can. Ent., 1875, VII, p. 222.

Male.—"This is allied to *tritona* and *grisea*, but is a smaller species wanting all the black dashes. The ground color is blackish shaded over with whitish. The lines black, single, denticulate. The claviform is indicated by a slight black mark. Orbicular obsolete. Reniform whitish, rounded, with its outer edge black-lined and shaded. Transverse anterior line running in a little on median vein. Transverse posterior line inaugurated a little above the reniform, running well outwardly, denticulate throughout its length. Subterminal line hardly apparent; a blackish shade over median nervules on the gray terminal space. Fringes gray, preceded by blackish interspaceal markings. Hind wings fuscous, lighter toward the base, with indistinct line.

Beneath much paler, irrorate, without discal marks and with a common shaded line. Expanse, 32 mm. Quebec. Mr. Bowles."

The above is Mr. Grote's description and fairly characterizes the species. It is also credited generally to the "Eastern and Northern States," and I have it from the Adirondack Mountains in July. I have also seen a specimen from northern New Hampshire, but the creature is apparently rare.

ACRONYCTA PYRALIS Smith.

(Plate XIII, fig. 12, male adult.)

Acronycta pyralis Smith, Ent. News, 1895, VI, pl. xv, fig. 1; Ent. News, 1896, VII, p. 26.

Ground color a very dark powdery gray; head and thorax without distinct markings, but the tip of the collar grayish and the patagiae indefinitely black margined. The primaries have all the ordinary maculation evident, but not sharply defined. Basal line single, black, and marked on the costa only. Transverse anterior line nearly upright, outcurved between the veins, black, preceded by a few pale scales. Transverse posterior line widely outcurved over the cell and a little incurved below, usually remote from the center of the wing; black in color, lunate between the veins and followed by a paler gray shade. Subterminal line obscure, and marked only by an irregular and incomplete preceding dark shade. There is a series of blackish terminal lunules and a very evident, blackish, somewhat diffuse shade across the median space close to and parallel with the transverse posterior line, somewhat obscuring the reniform. Orbicular large, oval, obscurely defined by black scales, with or without a dark central spot. Reniform broad, upright, a little incurved; outwardly a little paler than the ground color, but inferiorly obscured by the median shade. Secondaries smoky, with an indefinite extra-median line and pale fringes. Beneath, smoky and powdery; both wings with an outer line.

Expanse, 1.24 to 1.36 inches (31 to 34 mm.).

Habitat.—Calgary, July 13.

Two specimens, both females, were sent me by Mr. Dod under the number 31, and this is said to represent his stock. The species is the darkest of all those known to me, resembling *lithospila* in this respect, but quite different in markings.

This species is allied to *dentata* with which it is congeneric. It can not remain in *Acronycta;* but I am at a loss to place it as yet, and prefer to leave it here for the present.

ARSILONCHE Lederer.

Arsilonche Lederer, Noctuinen Europas, 1857, p. 70.

Moderately stout species, with fine hairy vestiture, rather narrow, somewhat pointed primaries which bear no trace of transverse maculation.

Head moderate in size, distinct but not prominent, more retracted in the female, front convex but not prominent. Eyes full, well separated, naked and without lashes. Ocelli distinct. Antennae simple in both sexes, but a little thicker and with the joints somewhat marked in the male. Palpi rather feebly developed, yet reaching well to the front, though not to its middle in the female. Tongue weak, not useful for feeding.

Thorax stout, convex, clothed with long, fine hair, which forms no tufts, and in well-preserved specimens scarcely outlines the collar and patagiae. Legs of the usual noctuid type, well developed, unarmed except for the usual tibial spurs.

Abdomen conic, in both sexes exceeding the anal angle of the secondaries, clothed with fine hair which forms no tufts.

Primaries narrow, moderate in length, the outer margin oblique, apex somewhat pointed. In venation normally noctuidous. Secondaries trigonate, proportionate, vein 5 weak and from the cross-vein well removed from 4.

This genus differs from *Acronycta* only in the weak tongue and fine hairy vestiture, characters in which *oblinita* and *lanceolaria* are only a little less distinguished.

There is, however, an entire absence of the usual *Acronyctid* appearance and maculation, which must be given some weight, and the superficial resemblance to *Leucania* is so great that the species has been twice redescribed in that genus.

In sexual characters the species agrees with the *auricoma* group of *Acronycta*.

Our only species, which is the same as the European, is:

ARSILONCHE ALBOVENOSA Goeze.

(Plates X, fig. 7, female adult; XVII, fig. 2, legs; XXII, fig. 21, male genitalia.)

Noctua albovenosa Goeze, Ent. Beitr., 1781, III, 3, p. 251.

Arsilonche albovenosa Morrison, Proc. Ac. Nat. Sci., Phila., 1875, p. 428.—Harvey, Can. Ent., 1876, VIII, p. 35.—Grote, Can. Ent., 1883, XV, p. 30.

Leucania henrici Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 10.

Ablepharon henrici Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 112, pl. I, fig. 15.—Morrison, Proc. Ac. Nat. Sci., Phila., 1875, p. 428, pr. syn.—Grote, Can. Ent., 1883, XV, p. 30, an sp. dist. pr.

Leucania evanidum Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 10.

Ablepharon evanidum Grote, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 112, pl. I, fig. 16.—Morrison, Proc. Ac. Nat. Sci., Phila., 1875, p. 428, pr. syn.

Ablepharon fumosum Morrison, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 275.

Arsilonche fumosum Morrison, Proc. Ac. Nat. Sci., Phila., 1875, p. 428.

Ground color a very pale luteous gray, fading to almost white. Thorax with disk and patagiae more or less shaded with luteous or gray. Primaries with all the veins whitish, often margined with slate gray, the intervening space of the ground color. A more prominent slate-gray streak runs through the submedian interspace from the base, where it is most distinct, to the outer margin, where it is almost faded out to the ground color. A second streak starts narrowly in the median cell and widens outwardly, becoming somewhat diffuse before the outer margin. At the apex the space between the veins is also darker, slate gray. The fringes and all the margins are white or nearly so. There is no transverse maculation and no trace of the ordinary spots; but in well-preserved specimens there is a series of small, slate-gray, interspaceal dots. Secondaries white, sometimes a trifle soiled toward the outer margin, where there is sometimes a faint dusky shade at the base of the fringes. Beneath white, the disk of primaries sometimes a little smoky, sometimes the costal region of both wings yellowish.

Expanse, 1.35 to 1.70 inches (34 to 42 mm.).

Habitat.—British America and United States generally; Canada, May and June; Massachusetts, in April; central New York, in June and July; Kansas and California, in January.

This widely distributed species is easily recognizable by its strigate, gray maculation on a whitish ground, resembling the species of *Leucania* in this particular. The variation is almost entirely due to the condition of the insect and its relative freshness. In recent specimens all the described streakings are fully marked and we have the typical *albovenosa;* after they have become a little faded by flight the gray changes to a luteous and we have *evanidum*.

Mr. Morrison's *fumosum* is an abnormally dark form in which almost the entire insect becomes slate gray. It is perhaps a question whether the name should be retained, but as it is not strictly a synonym I list it as an aberration, as which it has been already recognized.

The harpes of the male are oblong, a little rounded at tip, at the lower angle of which are a couple of little pegs. The clasper is a long, slender, curved hook resting on an oblique chitinous base which is inferiorly continuous with the clasper.

This species is not rare.

LARVA.

THAXTER, Psyche, 1877, I, p. 188.—COQUILLETT, Can. Ent., 1880, XII, p. 45.—HENRY EDWARDS, Ent. Amer., 1888, III, p. 171.—SNYDER, Ent. News, 1894, V, p. 277.

Stage IV.—Head bilobed, shining black, translucent whitish mottlings at the side, a patch at vertex of each lobe and a broken inverted V-mark bordering the clypeus; width, 1.2 mm. Body a little flattened. Warts large, black, with rather short bristly black hairs mixed with pale; warts nearly in line transversely. A black dorsal shade band filling in between the warts on joints 5 to 12; a mottled, transversely streaked lateral band and traces of brown subventrally. Cervical shield and anal plate black.

Stage V.—Head as before, but the white spaces smaller; width, 1.8 mm. Body largely mottled and streaked with black, a pale subdorsal line;

orange red blotches between the warts subdorsally and substigmatally. Hair short, stiff, black and white.

Stage VI.—Head bilobed, black, clypeus yellowish, the black pigment spotted, leaving a number of white streaks on the sides, a streak over the apex and a clypeal V-mark; lower half of clypeus and antennae white; width, about 2.7 mm. Body black, a white subdorsal line blotched with red between warts I and II; lateral area mottled with white; a white substigmatal band, passing over wart V, with orange blotches above it on the small wart IV. Warts large, I to III and VI dark, IV and V reddish. The black dorsum is broken by little white dots close to the incisures. Hairs as before. Later the white marks become yellow.

Stage VII.—Head shining black, side pieces of clypeus white or red, forming a V mark, a white streak on vertex of each lobe and a network of confluent white lines on the sides; width, 4 mm. Body black, the warts light orange red, obscurely connected by this color. Traces of dorsal, distinct subdorsal line, broken and mottled, the whole side area thickly covered with little streaks and dots of yellow; a straight, even, narrow yellow stigmatal band, crossing the orange wart IV. Subventral area and venter heavily yellow dotted; a geminate pale medio-ventral band. Hair black and white, bristly, mixed with softer hairs which predominate subventrally. No secondary hairs.

Cocoon.—Spun tightly among leaves; composed of silk.

Pupa.—Black, except in the joinings of the parts, where it is reddish; coarsely roughened. Anal segments rapidly tapering; the segments have a distinct smooth raised posterior rim and are coarsely granular in front, the granules rounded, subconfluent. Wing cases coarsely shagreened. Cremaster a tapering continuation of the last segment, not differentiated, but bearing a thick terminal tuft of fine straight spines.

Food plants.—Grass, smartweed, willow.

MEROLONCHE Grote.

Meroloncha GROTE, Ill. Essay, 1882, p. 50.

Very robust, shaggy species, with loose, divergent vestiture, retracted head, weak tongue, and shortly pectinated male antennae.

Head small, retracted, front narrow, a little conically protuberant, though this varies in the species. Eyes small, naked, without hairy lashes. Palpi small, hardly exceeding the front, clothed with rather stiff, diverging hair. Tongue weak, useless for feeding. Antennae shortly pectinated in the male, simple in the female.

Thorax well developed, robust, convex; patagiae and collar well marked, the vestiture thick, rather loose, and composed of somewhat flattened hair. No tufts are formed, but there is a bunching of the vestiture posteriorly. Legs rather short and stout, proportioned, as usual in the Noctuids, but comparatively smaller and with shorter tarsal joints, of which that at base is somewhat enlarged, especially on the forelegs.

Abdomen robust, conic in the male and only a little exceeding the hind angle of the secondaries; much heavier and more cylindrical in the female, and quite considerably exceeding the anal angle of the secondaries. No tuftings except the usual loose bunching at the sides of the segments in the male.

Primaries rather short and narrow, trigonate, outer margin oblique, apex a little produced. Venation in both wings of the normal Noctuid type and not in any way different from *Acronycta*.

This genus is well distinguished from its allies, not only in the general habitus but in the shortly pectinated antennae of the male. In this character it resembles *Harrisimemna*, while totally distinct in all other respects.

There are three rather unsatisfactory species, of which *spinea* and *lupini* were described by Mr. Grote, and *ursina* is here first named.

Of *spinea* I have seen the types only; of *lupini* I have had numerous specimens which, while greatly varying in certain directions, never quite reached the former type.

Spinea has a very evident angulated median shade line; the other median lines are obscured and the ordinary spots are wanting or but feebly indicated.

Lupini is a much better marked species, with the median lines and ordinary spots well developed and the median shade line obscure or at least not prominent. This is a somewhat variable quantity, however, and the sharply defined orbicular and somewhat smudgy reniform are much more constant factors. Both species are Californian.

Ursina is a smaller species, more hairy in appearance, the primaries very evenly sprinkled with white and black scales, so as to give a powdery ashy gray appearance in which all the markings are sunken, though traceable. The species is altogether slighter, especially in the female, in which the abdomen is neither so long nor so clumsy. It occurs in the mountainous regions of Colorado.

The sexual characters of the male are essentially those of group *auricoma*, the harpes oblong, somewhat acutely rounded at the tip, the clasper essentially a long, curved hook set on an oblique ridge, which may or may not form an inferior process.

In tabular form the species divide as follows:

ANALYTICAL KEY TO SPECIES OF MEROLONCHE.

Median shade line distinct, angulated, forming the most prominent feature of the primaries; ordinary spots obsolete.................................*spinea*.
Median shade line subordinate or wanting; ordinary spots present.
    Less powdery; all the ordinary markings fairly evident; with a vague yellowish tinge.................................*lupini*.
    Densely powdered, obscuring the ordinary markings; total impression a bluish ash gray.................................*ursina*.

MEROLONCHE LUPINI Grote.

(Plates III, fig. 2, adult; X, fig. 4, female adult; XV, fig. 8, male antenna; XVII, fig. 1, legs; XXII, fig. 23, male genitalia.)

Apatela lupini GROTE, Bull. Buff. Soc. Nat. Sci., 1873, I, p. 79; Ibid., 1876, III, p. 78.
Merolonche lupini GROTE, Ill. Essay, 1882, p. 50; Papilio, 1883, III, p. 112.

General color a somewhat yellowish ashen gray. Collar and patagiae more or less black marked, but without very definite lines or bands. Primaries powdery, but rather smooth, and with all the markings well written. Basal line geminate, evident on the costa, vague below that point. Transverse anterior line geminate, the inner narrow, outwardly bent and outcurved between the veins; the outer diffuse and more evenly oblique. Transverse posterior line distinct, denticulate, a little sinuate, but as a whole parallel with the outer margin. As a rule it is continuous, but it is sometimes broken into lunules and is then preceded by a white shade. Median shade line evident in all specimens, but most distinct in the female; narrow, diffuse, irregular, obviously angulated on the median vein, and reaching the internal margin close to the outer part of the transverse anterior line. Subterminal line pale, diffuse, marked outwardly by a series of more or less connected dusky spots. A series of black terminal dots, beyond which the fringes are cut with black. Orbicular small or moderate in size, round, concolorous, outlined in blackish. Reniform moderate in size, imperfectly defined, and somewhat obscured by the median shade which crosses it and forms the inward angle just below. Secondaries smoky, with a discal lunule, and crossed by two vague dusky shades between and beyond which the wing is paler. Beneath, primaries dusky with a broad gray outer margin; secondaries gray, with a large black discal lunule and an incomplete dusky band.

Expanse, 1.50 to 1.75 inches (37 to 44 mm.).

Habitat.—Mendocino County, California.

Specimens of this species are usually in unsatisfactory condition because of their tendency to grease, and the yellowish tinge that is usual is probably not natural. The species is fairly well marked, but it is quite certain that another smaller and more powdery species which may be my *ursina* has been confused with it. The true species is quite evenly gray and scarcely "hoary." The only variation in the seven specimens before me is in the relative distinctness of the median shade line.

MEROLONCHE SPINEA Grote.

(Plate X, figs. 2, 3, male and female adults.)

Apatela spinea GROTE, Bull. Buff. Soc. Nat. Sci., 1876, III, p. 78.
Acronycta spinea HENRY EDWARDS, Pac. Coast Lep., No. 27, 1878, p. 3.
Merolonche spinea GROTE, Ill. Essay, 1882, p. 50; Papilio, 1883, III, p. 112.

Female.—"This species resembles *lupini* in structure and size, and may not be eventually considered a good species. It differs by the transverse posterior line being narrower, more continuous, less scalloped; opposite the cell, between veins 6 and 4, it is drawn in, forming as usual a point on the intermediate vein 5. Else, while whiter, much like its ally, the submedian dash well marked, the fringes checkered. Hind wings blackish, with white fringes; tegulae black lined."

The above is Mr. Grote's original description, but none of the characters hold. Nevertheless, judging from the extremely scanty material, the species seems distinct by the absence of the ordinary spots and the prominence of the narrow, rather sharply defined median shade line. The species, if species it is, seems much less abundant than its congeners, hence it is impossible to speak of the range of variation. I have seen the types only, from which the pictures have been made by the courtesy of the officials of the American Museum of Natural History. "California," is given as the *habitat.*

MEROLONCHE URSINA, new species.

(Plates X, figs. 5, 6, male and female adults; XXII, fig. 22, male genitalia.)

Dull ashen gray, very strongly powdered with blackish hair-like scales, which give the insect a peculiar shaggy appearance. Head and thorax without obvious markings, though the patagiae seem a little dark margined and the posterior mass of thoracic vestiture is smoky. Primaries with the markings obscure, fragmentary, and not at all defined. Basal line not traceable. Transverse anterior line geminate, broken, as a whole nearly upright, with three rather even, though small, outcurves. Transverse posterior line well removed toward the outer margin, with which its course is nearly parallel and only a little sinuate, consisting of a series of black lunules preceded by a whitish shading. Subterminal line pale, consisting of a vague shading more or less marked by dusky spots in the interspaces, sometimes not at all traceable. There is a series of blackish terminal lunules, beyond which the fringe is cut with dusky. Orbicular small, round or oval, concolorous, black-ringed. Reniform small, kidney-shaped, imperfectly defined by two black lunules. Secondaries whitish, powdery, more smoky in the female. Beneath, gray, powdery, with an indefinite outer line and discal spot on all wings.

Expanse, 1.40 to 1.60 inches (35 to 40 mm.).

Habitat.—Colorado.

Several specimens of both sexes have been at hand, most of them collected by Mr. David Bruce in the mountainous districts toward Glenwood, whence Dr. William Barnes has also received it. As compared with *lupini* the species has smaller, narrower, and more pointed primaries and a larger, more quadrate thorax, with proportionately smaller abdomen. The vestiture is more divergent and more hairy, and the insect as a whole has a bluish tinge. None of the markings are evident and there is only a vague indication in some specimens of a median shade. The secondaries are also paler, and altogether the species gives quite a different impression from *lupini*. I have in the past labeled specimens, with a query, as *spinea*, which I did not know positively until now.

I have three specimens from the Sierra Nevada Mountains in California which are probably referable to this species, but their condition is not such that I would care to say this positively. They are certainly neither *spinea* nor *lupini*, and I am not yet ready to admit another species.

HARRISIMEMNA Grote.

Harrisimemna GROTE, Trans. Am. Ent. Soc., 1873, IV, p. 293.

A somewhat slight-bodied form with long, prominently tufted abdomen, strongly tufted thorax, large trigonate wings, and a somewhat retracted head.

Head moderate in size, distinct, but not prominent, front slightly convex, but not bulging. Eyes large, narrowly separated, naked, without lashes. Ocelli distinct and not concealed. Tongue moderate, suitable for feeding, but not strong. Palpi short and weak, hardly reaching to the end of the projecting scales of the front. Antennae very shortly pectinated in the male, simple in the female.

Thorax rather small, quadrate, convex, thickly clothed with scales and scaly hair, which form an enormous bushy, posterior tuft; collar and patagiae distinct. Legs slender, short for the insect, but of normally noctuid proportion to each other. Unarmed except for the usual spurs, which are of very moderate size.

Abdomen cylindrical, much exceeding the anal angle of the secondaries in both sexes, much stouter in the female. In both sexes with a series of dorsal tufts, of which that on the fourth segment is enormously exaggerated.

Primaries trigonate, the apices somewhat drawn out in the male, rectangular in the female. In the former inner and outer margin are almost of a length, while the costa is at least one-half longer; in the latter the outer margin is distinctly shorter than the inner, and the costa is hardly one-third longer than the latter. The venation is normally noctuidous.

Secondaries proportionate, vein 5 much weaker than the others and arising from the cross vein well removed from 4, but nearer to it than to 6.

The only species thus far known is:

HARRISIMEMNA TRISIGNATA Walker.

(Plates XV, fig. 6, male antenna; XVI, fig. 6, venation; XVII, fig. 4, legs; XIX, fig. 9, male genitalia.)

Grammophora trisignata WALKER, Cat. Brit. Mus , Het., 1856, IX, p. 29.

Harrisimemna trisignata GROTE, Trans. Am. Ent. Soc., 1873, IV, p. 293; Ill. Essay, 1882, p. 49, pl. I, fig. 3.

Notodonta sexguttata HARRIS, Ent. Corresp., 1869, p. 174, figs. 24, 25.—GROTE, Trans. Am. Ent. Soc., 1873, IV, p. 293, pr. syn.

Ground color of head and primaries white, with either a creamy or bluish tinge, varying in the specimens. Palpi black marked. Head with a broad black band above the middle, a short, narrow one below the antennae, and another somewhat broader between the feelers. Collar white at base, crossed by a broad black band, the upper portion red-brown, the edges tipped with white scales. Thorax red-brown, the edges of the patagiae white tipped. Abdominal tuftings at base white, with black tips, the prominent tufts brown. Primaries white with the ornamentation black and contrasting, but a little confused by irregular black powderings, which sometimes darken the inferior portion of the median space. The most prominent features are three almost round, red-brown patches situated as follows: One near the base, filling the space between the basal and transverse anterior lines and the costa and median vein; another close to the apex, filling the space between the transverse posterior and subterminal lines, the costa, and vein 6; the third just above the hind angle extending from the transverse posterior line almost to the exterior margin and between veins 2 and 3. Basal line geminate, prominent, black, terminating in a larger black patch in the submedian interspace. Transverse anterior line geminate, almost upright, outcurved in the interspaces; the inner line well defined, the outer often diffuse and powdery. Transverse posterior line geminate, very irregularly dentate, outwardly angulate so as to from two prominent teeth on veins 3 and 4. Both lines are distinct, but the inner tends to become diffuse. There is no obvious subterminal line, but there is a series of disconnected spots and shades which may represent it. A series of black terminal lunules is preceded by narrow white crescents. Fringes white, cut with blackish. The median shade line is prominently marked on the costa, but is obscured below that point by the black powderings. Orbicular moderate, round, concolorous, black-ringed and with a black center. Reniform large, kidney-shaped, black-ringed, with a dusky central lunule. Secondaries in the male white, with blackish apical powderings and a series of smoky terminal lunules; in the female deep smoky brown with contrasting white fringes. Beneath, whitish in the male, apices of both wings smoky and both with an imperfect extra discal dark line; in the female, primaries smoky, with contrasting white fringes which are cut with brown; secondaries whitish with two smoky transverse lines, a broad smoky margin, and a dark discal lunule.

Expanse, 1.20 to 1.55 inches (30 to 35 mm.).

Habitat.—Canada to Texas, west to Wisconsin and Missouri; Canada in July; Massachusetts in June; Long Island, New York, in July.

This is one of the most distinct of the North American noctuids and certainly by all odds the most aberrant and striking of those here treated. The three round brown patches on each wing give the insect an absolutely unique appearance. The only observable variation is in the amount of the black powdering.

LARVA.

Melsheimer, Harris's Corresp., 1869, p. 114.—Harris, Ent. Corr., 1869, p. 174, fig. 25.—Packard, Guide, 1869, p. 304.—Goodhue, Can. Ent., 1886, XVIII, p. 58.—Dyar, Ent. News, 1895, VI, p. 340.

Stage V.—Width of head, 1.7 mm.; shaped as in the next stage.

Stage VI.—Width of head, 2.2 mm. Slightly bilobed, clypeus very high, a long conical tubercle before the apex of each lobe, pointing obliquely forward, bearing the upper epicranial seta on its upper aspect before the tip; setae short, stiff.

Stage VII.—Head slightly bilobed, higher than wide, smooth and rounded, no tubercles; width, 3.3 mm. Black with a reddish shade in the sutures, shining. Body compressed, higher than wide; feet, especially the abdominal, very long. Joints 5–7 slender and arched, 12 very strongly humped, tubercles I and II in an elevated square, the lower part of the segment small, so that joint 13 with the anal feet is placed nearly directly beneath it. Tubercles large, chitinous on the humped parts, elsewhere small, reduced to single setae, except VI, which bears many, and II on thorax, which bears two, setae. Hair stiff, long, especially on the humped parts, white. Cervical shield attached to the head by a firm membrane, the anterior dorsal pair of hairs being attached at the tip to the labrum of the head case of the preceding stage, forming a string of cast heads. Color black, shading into red-brown on the anterior side on the hump on joint 12 and thoracic feet. Sides of joints 7 to 10 streaked and washed with whitish flesh-color, joining over the back centrally. The larvae are solitary, wagging the string of cast heads from side to side when disturbed.

Cocoon.—A hole of the diameter of the body of the larva bored in wood "one-fourth inch horizontally, then down about 2 inches like a woodpecker's hole in miniature, the opening covered with thin parchment-like silk very near the color of the bark. The chips are wadded up into balls about the size of B shot" (Goodhue).

Food plants.—Winterberry, lilac.

LIST OF THE GENERA AND SPECIES.

PANTHEINAE.

PANTHEA Hübner.

1. furcilla Packard.
2. gigantea French.
3. portlandia Grote.
4. acronyctoides Walker.
   leucomelana Morrison.

DEMAS Stephens.

1. propinquilinea Grote.

DEMAS Stephens—Continued.

2. flavicornis Smith.
3. palata Grote.

CHARADRA Walker.

1. deridens Guenée.
   circulifera Walker.
   contigua Walker.
2. dispulsa Morrison.
3. decora Morrison.

ACRONYCTINI.

ACRONYCTA Ochsenheimer.

Group **AMERICANA**.

1. rubricoma Guenée.
2. americana Harris.
   - *aceris* ‡ Smith and Abbot.
   - *acericola* Guenée.
   - *hastulifera* ‡ larva Guenée.
   - *obscura* Henry Edwards.
3. hastulifera Smith and Abbot.
   - *acericola* ‡ larva Guenée.
4. hesperida Smith.
5. dactylina Grote.
6. felina Grote.
7. frigida Smith.
   - *lepusculina* ‡ Edwards.
   - *felina* ‡ French.
8. pacifica Smith.
9. insita Walker.
   - var. canadensis Smith.
10. cretata Smith.
11. leporina Linnaeus.
    - *vulpina* Grote.
    - *sancta* Henry Edwards.
12. populi Riley.
13. lepusculina Guenée.
14. cinderella Smith.
15. transversata Smith.
16. tota Grote.

Group **LOBELIAE**.

17. innotata Guenée.
    - *graefii* Grote.
18. betulae Riley.
19. morula Grote and Robinson.
    - *ulmi* Harris.
20. occidentalis Grote and Robinson.
    - *psi* ‡ Guenée.
    - *interrupta* Guenée.
21. laetifica Smith.
22. lobeliae Guenée.
23. furcifera Guenée.
24. hasta Guenée.
    - *telum* Guenée.
25. manitoba Smith.
26. thoracica Grote.
27. strigulata Smith.
28. radcliffei Harvey.
29. quadrata Grote.
30. spinigera Guenée.
    - *harveyana* Grote.
31. pruni Harris.
    - *clarescens* ‡ Grote.

Group **LOBELIAE**—Continued.

32. brumosa Guenée.
    - *impleta* Walker.
    - *subochrea* Grote.
33. superans Guenée.
34. lithospila Grote.
35. tritona Hübner.
36. connecta Guenée.
37. funeralis Grote and Robinson.
    - *americana* ‡ Harris.
38. fragilis Guenée.
    - *spectans* Walker.
39. minella Dyar.
40. paupercula Grote.
41. vinnula Grote.
42. revellata Smith.
43. grisea Walker.
    - *pudorata* Morrison.
44. mansueta Smith.
45. falcula Grote.
46. parallela Grote.

Group **PERSUASA**.

47. afflicta Grote.
48. persuasa Harvey.
49. liturata Smith.
50. marmorata Smith.

Group **HAMAMELIS**.

51. albarufa Grote.
    - *walkeri* Andrews.
52. ovata Grote.
53. modica Walker.
    - *exilis* Grote.
54. clarescens Guenée.
    - *haesitata* Grote.
55. hamamelis Guenée.
56. increta Morrison.
57. retardata Walker.
    - *dissecta* Grote and Robinson.

Group **AURICOMA**.

58. illita Smith.
59. luteicoma Grote and Robinson.
60. sperata Grote.
61. noctivaga Grote.
    - *longa* ‡ Walker.
62. emaculata Smith.
63. impressa Walker.
    - *fasciata* Walker.
    - *brumosa* ‡ Grote.
    - *verrillii* Grote and Robinson.

ACRONYCTINI—Continued.

ACRONYCTA Ochsenheimer—Continued.

Group AURICOMA—Continued.

64. distans Grote.
65. barnesii Smith.
66. perdita Grote.
67. edolata Grote.
68. extricata Grote.
69. xyliniformis Guenée.
    longa Guenée.
    spinigera ‡Grote.
    pallidicoma Grote.
70. oblinita Smith and Abbot.
    salicis Harris.
71. lanceolaria Grote.
72. insolita Grote.
73. dentata Grote.
74. pyralis Smith.

ARSILONCHE Lederer.

1. albovenosa Goeze.
    henrici Grote.
    cranidum Grote.
    ab. fumosum Morrison.

MEROLONCHE Grote.

1. spinea Grote.
2. lupini Grote.
3. ursina Smith.

HARRISIMEMNA Grote.

1. trisignata Walker.
    sexguttata Harris.

EXPLANATION OF PLATES.

PLATE I.

Illustrations of species of *Acronycta:*

Fig. 1. *Acronycta lepusculina* Guenée.
2 *Acronycta americana* Harris.
3. *Acronycta dactylina* Grote.
4. *Acronycta rubricoma* Guenée.
5. *Acronycta luteicoma* Grote and Robinson.
6. *Acronycta superans* Guenée.
11. *Acronycta noctivaga* Grote.
12. *Acronycta impressa* Walker.
13 *Acronycta lithospila* Grote.
14. *Acronycta hasta* Guenée.
15. *Acronycta afflicta* Grote.

The numbers 7 to 10, inclusive, are wanting on the plate. Fig. 14 is hardly characteristic and represents an abnormal type.

This and the plates following, to and including Plate VII, were prepared for the U. S. Department of Agriculture as stated in the Introduction.

PLATE II.

Illustrations of species of *Acronycta:*

Fig. 1. *Acronycta hamamelis* Guenée; normal type.
2. *Acronycta hamamelis* Guenée; suffused form.
3. *Acronycta hamamelis* Guenée; pale form.
4. *Acronycta modica* Walker.
5. *Acronycta retardata* Walker.
6. *Acronycta sperata* Grote.
7. *Acronycta psi* Linnaeus (European).
8. *Acronycta occidentalis* Grote and Robinson.

Fig. 9. *Acronycta tritona* Hübner.
10. *Acronycta morula* Grote and Robinson.
11. *Acronycta lobeliae* Guenée.
12. *Acronycta hastulifera* Smith and Abbot; female.
13. *Acronycta furcifera* Guenée; male.
14. *Acronycta furcifera* Guenée; female.
15. *Acronycta furcifera* Guenée; female.
16. *Acronycta connecta* Grote.
17. *Acronycta innotata* Guenée; normal.
18. *Acronycta innotata* Guenée; rare form.
19. *Acronycta betulae* Riley.

Fig. 14 represents an unusually small pale form; fig. 15 is nearer the usual type.

PLATE III.

Illustrations of species of *Acronycta* and *Merolonche:*

Fig. 1. *Acronycta quadrata* Grote.
2. *Merolonche lupini* Grote.
3. *Acronycta clarescens* Guenée.
4. *Acronycta grisea* Walker.
5. *Acronycta hastulifera* Smith and Abbott; male.
6. *Acronycta perdita* Grote.
7. *Acronycta funeralis* Grote and Robinson.
8. *Acronycta thoracica* Grote.
9. *Acronycta parallela* Grote.
10. *Acronycta albarufa* Grote.
11. *Acronycta persuasa* Harvey.
12. *Acronycta lactifica* Smith.

Fig. 10 is bad in all points, and reference should be had to Plate XII, fig. 9, for a more accurate figure.

PLATE IV.

Illustrations of species of *Acronycta:*

Fig. 1. *Acronycta edolata* Grote.
2. *Acronycta hasta* Guenée.
3. *Acronycta insita* Walker; male.
4. *Acronycta pruni* Harris.
5. *Acronycta xyliniformis* Guenée; female.
6. *Acronycta oblinita* Smith and Abbot; male.
7. *Acronycta ovata* Grote.
8. *Acronycta ovata* Grote.
9. *Acronycta modica* Walker.
10. *Acronycta xyliniformis* Guenée; male.
11. *Acronycta vinnula* Grote.
12. *Acronycta xyliniformis* Guenée.
13. *Acronycta oblinita* Smith and Abbot; female.
14. *Acronycta oblinita* Smith and Abbot; male.
15. *Acronycta xyliniformis* Guenée; female.

Fig. 14 represents an unusually small form, the usual size being better shown at 6. Figs. 5, 10, 12, and 15 fairly represent the variation in the species named.

PLATE V.

Larvae of *Acronycta:*

Fig. 1. *Acronycta afflicta;* larva above.
2. *Acronycta afflicta;* larva in characteristic position on a leaf.
3. *Acronycta ovata;* larva at rest on leaf.

Fig. 4. *Acronycta betulae;* immature larva.
5. *Acronycta betulae;* full-grown larva.
6. *Acronycta modica;* larva above.
7. *Acronycta occidentalis;* larva above.
8. *Acronycta occidentalis;* larva from side.
9. *Acronycta radcliffei;* larva above; its head much enlarged at *9a*.

Fig. 9 is bad in all respects, and was made from a discolored specimen stiffened by a fungus growth.

PLATE VI.

Larvae of *Acronycta:*

Fig. 10. *Acronycta furcifera;* larva above.
11. *Acronycta radcliffei;* larva from side.
12. *Acronycta hastulifera;* larva above.
13. *Acronycta hastulifera;* larva from side.
14. *Acronycta rubricoma;* larva; green form, with yellow, almost complete, tufts.
15. *Acronycta rubricoma;* larva; yellow form with black tufts partly lost.
16. *Acronycta luteicoma;* larva above.
17. *Acronycta americana;* larva from side.

PLATE VII.

Larvae of *Acronycta:*

Fig. 18. *Acronycta dactylina;* larva above.
19. *Acronycta dactylina;* larva from side.
20. *Acronycta morula;* larva above.
21. *Acronycta morula;* larva from side.
22. *Acronycta pruni;* larva above.
23. *Acronycta pruni;* larva from side.
24. *Acronycta lobeliae;* larva above.
25. *Acronycta populi;* larva in characteristic position on leaf.

PLATE VIII.

Larvae of *Acronycta:*

Fig. 26. *Acronycta leporina;* larva in characteristic position on leaf.
27. *Acronycta noctivaga;* larva above.
28. *Acronycta noctivaga;* larva from side.
29. *Acronycta oblinita;* larva above; pale form with red hair.
30. *Acronycta oblinita;* larva from side; black form with pale hair.
31. *Acronycta sperata;* larva from side.
32. *Acronycta sperata;* larva above.
33. *Acronycta impressa;* larva above.
34. *Acronycta impressa;* larva from side.
35. *Acronycta xyliniformis;* larva from side and from above.
36. *Demas propinquilinea;* larva on leaf from side.
37. *Panthea furcilla;* larva from side on pine.

From figures drawn and colored by Miss L. Sullivan under the direction of Dr. C. V. Riley.

PLATE IX.

Illustrations of Pantheids:

Fig. 1. *Panthea furcilla* Packard; female.
2. *Panthea gigantea* French; male.
3. *Panthea gigantea* French; female.
4. *Panthea portlandia* Grote; female.

Fig. 5. *Panthea acronyctoides* Walker; male.
6. *Panthea acronyctoides* Walker; female, from an imperfect specimen.
7. *Demas propinquilinea* Grote; male.
8. *Demas propinquilinea* Grote; female.
9. *Demas flavicornis* Smith; male.
10. *Demas flavicornis* Smith; female.
11. *Charadra dispulsa* Morrison; male.
12. *Charadra deridens* Guenée; female.

Reproduced from slightly enlarged photographs. All of the prints from which these plates of adult insects were made have been touched up with a brush to cure imperfections and to secure somewhat stronger contrasts.

PLATE X.

Illustrations of *Acronycta* and allied genera:

Fig. 1. *Demas palata* Grote; male.
2. *Merolonche spinea* Grote; from the male type.
3. *Merolonche spinea* Grote; from the female type.
4. *Merolonche lupini* Grote; from the female type.
5. *Merolonche ursina* Smith; male.
6. *Merolonche ursina* Smith; female.
7. *Arsilonche albovenosa* Goeze; female.
8. *Acronycta insita* Walker; male.
9. *Acronycta hesperida* Smith; from the female type.
10. *Acronycta transversata* Smith; from the male type.
11. *Acronycta tota* Grote; female.

Somewhat larger than natural size and reproduced from enlarged photographs.

PLATE XI.

Illustrations of species of *Acronycta*:

Fig. 1. *Acronycta leporina* Linnaeus; male.
2. *Acronycta leporina* Linnaeus; female, from American specimens.
3. *Acronycta cretata* Smith; from a male type.
4. *Acronycta cretata* Smith; from a female type.
5. *Acronycta pacifica* Smith; from the male type.
6. *Acronycta frigida* Smith; from the male type.
7. *Acronycta populi* Riley; from a female type.
8. *Acronycta lepusculina* Guenée; female.
9. *Acronycta felina* Grote; female.
10. *Acronycta frigida* Smith; from a female type.
11. *Acronycta cinderella* Smith; from the male type.
12. *Acronycta illita* Smith; from the female type.

All are somewhat greater than natural size and are reproduced from enlarged photographs.

PLATE XII.

Illustrations of species of *Acronycta*:

Fig. 1. *Acronycta manitoba* Smith; from a female type.
2. *Acronycta paupercula* Grote; male.
3. *Acronycta fragilis* Guenée; female.
4. *Acronycta radcliffei* Harvey; male.
5. *Acronycta spinigera* Guenée; female.
6. *Acronycta strigulata* Smith; from a female type.
7. *Acronycta mansueta* Smith; from a male type.
8. *Acronycta falcula* Grote; female.

Fig. 9. *Acronycta albarufa* Grote; female.
10. *Acronycta ovata* Grote; female.
11. *Acronycta clarescens* Guenée; female.
12. *Acronycta hamamelis* Guenée; female.
13. *Acronycta increta* Morrison; female.
14. *Acronycta retardata* Walker; variety of female.

All are somewhat greater than natural size and are reproduced from enlarged photographs.

PLATE XIII.

Illustrations of species of *Acronycta:*

Fig. 1. *Acronycta brumosa* Guenée; female.
2. *Acronycta emaculata* Smith; from the male type.
3. *Acronycta marmorata* Smith; from the male type.
4. *Acronycta impressa* Walker; male.
5. *Acronycta impressa* Walker; female.
6. *Acronycta distans* Grote; male.
7. *Acronycta distans* Grote; female.
8. *Acronycta liturata* Smith; from a female type.
9. *Acronycta extricata* Grote; female.
10. *Acronycta barnesii* Smith; from a male type.
11. *Acronycta dentata* Grote; female.
12. *Acronycta pyralis* Smith; male.

All are somewhat greater than natural size and are reproduced from enlarged photographs.

PLATE XIV.

Body structures of *Acronycta* and allied genera:

Fig. 1. *Panthea portlandia;* head and thorax from above.
2. *Charadra dispulsa;* head and thorax from above.
3. *Acronycta americana;* head and thorax from above.
4. *Acronycta oblinita;* head and thorax from above.
5. *Panthea portlandia;* head and thorax from side.
6. *Acronycta americana;* thorax from side.
7. *Acronycta morula;* thorax from side.
8. *Acronycta retardata;* thorax from side.
9. *Arcronycta impressa;* thorax from side.
10. *Acronycta oblinita;* thorax from side.
11. *Acronycta americana;* ovipositor of female.
12. *Acronycta ovata;* ovipositor of female.
13. *Acronycta morula;* male genitalia seen from side (upper figure) and from beneath (lower figure).

All figures from drawings by Dr. J. B. Smith, except 11, 12, and 3, which are from sketches made by Mr. Theodore Pergande.

PLATE XV.

Head structures of *Acronycta* and allies:

Fig. 1. *Charadra deridens;* antenna of male at tip.
2. *Charadra deridens;* antenna of male toward base.
3. *Charadra dispulsa;* antenna of male at tip.
4. *Charadra dispulsa;* antenna of male near base.
5. *Panthea portlandia;* antenna of male near middle.
6. *Harrisimemna trisignata;* antenna of male toward tip.
7. *Raphia frater;* antenna of male near middle.
8. *Merolonche lupini;* antenna of male near middle; the details of structure are omitted on all save three joints.

Fig. 9. *Acronycta tritona;* base of maxilla, showing the maxillary palpus.
10. *Acronycta rubricoma;* head from above.
11. *Acronycta americana;* head from above.
12. *Acronycta morula;* head from above.
13. *Acronycta auricoma;* head from above.
14. *Acronycta xyliniformis;* head from above.
15. *Acronycta americana;* head from side.
16. *Acronycta rubricoma;* head from side.
17. *Acronycta morula;* head from side.
18. *Acronycta luteicoma;* head from side.
19. *Acronycta auricoma;* head from side.
20. *Acronycta xyliniformis;* head from side.
21. *Panthea portlandia;* head from front.
22. *Charadra deridens;* head from front.
23. *Acronycta americana;* head from front.

All from drawings by Dr. J. B. Smith; and, except the heads, made with camera lucida.

PLATE XVI.

Venation of *Acronycta* and its allies:

Fig. 1. Venation of primaries of *Panthea portlandia* toward the apex, and origin of veins 2 to 5 of secondaries.
2. Venation of *Demas flavicornis,* female.
3. *Demas flavicornis,* showing origin of veins 6 to 11 on primaries with accessory cell absent.
4. Variations in the shape of accessory cell and the origin of veins 6 to 10 in *Demas* and *Panthea.*
5. *Charadra dispulsa,* venation of primaries toward apex, and origin of veins 2 to 5 of secondaries.
6. Venation of *Harrisimemna trisignata,* female.
7. Venation of *Raphia frater,* female.
8. Venation of *Acronycta dactylina,* male.
9. *Acronycta betulae;* showing origin of veins 6 to 10 of primaries.
10. *Acronycta lithospila;* showing origin of veins 6 to 10 of primaries.
11. *Acronycta albarufa;* showing origin of veins 6 to 10 of primaries.

All from camera lucida sketches by Dr. J. B. Smith.

PLATE XVII.

Leg structures in *Acronycta* and allies:

Fig. 1. All legs of *Merolonche lupini.*
2. All legs of *Arsilonche alborenosa.*
3. All legs of *Acronycta dactylina.*
4. All legs of *Harrisimemna trisignata.*
5. All legs of *Charadra deridens.*
6. All legs of *Panthea portlandia.*
7. All legs of *Raphia frater.*
8. All legs of *Demas flavicornis.*
9. Anterior leg of male *Acronycta rubricoma.*
10. Anterior femur and tibia of *Acronycta americana,* male
11. Anterior leg of male *Acronycta dactylina.*
12. Anterior leg of male *Acronycta hastulifera.*
13. Anterior leg of male *Acronycta insita.*
14. Anterior leg of male *Acronycta leporina.*
15. Anterior leg of male *Acronycta cretata.*

Fig. 16. Anterior femur and tibia of *Acronycta populi*, male; *cinderella*, *transversata*, and *pacifica* are similar.
17. Anterior leg of male *Acronycta tota*.
18. Anterior leg of male *Acronycta innotata*.
19. Anterior tibia and tarsus of *Acronycta betulae*.
20. Anterior leg of male *Acronycta morula; occidentalis* is similar.
21. Anterior leg of male *Acronycta laetifica*.
22. Anterior leg of male *Acronycta lobeliae*.
23. Anterior leg of male *Acronycta rinnula*.
24. Anterior leg of male *Acronycta manitoba*.
25. Anterior leg of male *Acronycta grisea; revellata* is practically the same.
26. Anterior leg of male *Acronycta spinigera*.
27. Anterior leg of male *Acronycta pruni; radcliffei* is practically the same.
28. Anterior leg of male *Acronycta quadrata* and *tritona*.
29. Anterior leg of male *Acronycta persuasa*.
30. Anterior leg of male *Acronycta brumosa*.
31. Anterior leg of male *Acronycta clarescens*.
32. Anterior leg of male *Acronycta albarufa; orata*, and *hamamelis* are practically like it.

All the drawings were made by Dr. J. B. Smith with a camera lucida and to the same scale, so that the figures are comparable.

PLATE XVIII.

Miscellaneous structures in *Acronycta:*

Fig. 1. Showing position of tubercles on abdominal segments in larvae of lower Tineides.
2. Showing position of tubercles on abdominal segments in larvae of Sphinges.
3. Showing position of tubercles on abdominal segments in larvae of Bombyces.
4. Labial palpus of *Acronycta americana*.
5. Labial palpus of *Acronycta rubricoma*.
6. Labial palpus of *Acronycta betulae*.
7. Labial palpus of *Acronycta connecta*.
8. Labial palpus of *Acronycta pruni*.
9. Labial palpus of *Acronycta hamamelis*.
10. Labial palpus of *Acronycta pursuasa*.
11. Labial palpus of *Acronycta oblinita*.
12. Tarsal claw in *Acronycta rubricoma;* and this is the type found more or less marked in nearly all the species.
13. Anterior leg of male *Acronycta oblinita*.
14. Anterior leg of male *Acronycta xyliniformis*.
15. Anterior leg of male *Acronycta extricata*.
16. Anterior leg of male *Acronycta perdita*.
17. Anterior leg of male *Acronycta edolata* and *barnesii*.
18. Anterior leg of male (in group) *Acronycta persuasa*.
19. Anterior leg of male *Acronycta impressa*.
20. Anterior leg of male *Acronycta distans*.
21. Anterior leg of male *Acronycta noctivaga, sperata,* and *emaculata*.
22. Anterior leg of male *Acronycta illita*.
23. Anterior leg of male *Acronycta luteicoma*.
24. Anterior leg of male *Acronycta superans*.
25. Anterior leg of male *Acronycta modica*.
26. Anterior leg of male *Acronycta strigulata*.
27. Anterior leg of male *Acronycta funeralis* and *connecta*.
28. Anterior leg of male *Acronycta parallela*.

Fig. 29. Anterior leg of male *Acronycta paupercula.*
30. Anterior leg of male *Acronycta furcifera* and *hasta.*

Sketches for 1, 2, 3, were supplied by Dr. H. G. Dyar; all others are by Dr. J. B. Smith.

PLATE XIX.

Male genital structures in *Acronycta* and allies:

Fig. 1. Harpe and clasper of *Panthea portlandia.*
2. Harpe and clasper of *Panthea furcilla.*
3. Harpe and clasper of *Panthea gigantea.*
4. Harpe and clasper of *Panthea acronyctoides.*
5. Harpe and clasper of *Demas propinquilinea.*
6. Harpe and clasper of *Demas flavicornis.*
7. Harpe and clasper of *Charadra dispulsa.*
8. Harpe and clasper of *Charadra deridens.*
9. Harpe and clasper of *Harrisimemna tri-signata.*
10. Harpe and clasper of *Acronycta rubricoma.*
11. Harpe and clasper of *Acronycta americana.*
12. Harpe and clasper of *Acronycta aceris* (European).
13. Harpe and clasper of *Acronycta dactylina.*
14. Harpe and clasper of *Acronycta hastulifera.*
15. Harpe and clasper of *Acronycta hesperida.*
16. Harpe and clasper of *Acronycta insita.*
17. Harpe and clasper of *Acronycta leporina* (European).
18. Harpe and clasper of *Acronycta cretata.*
19. Harpe and clasper of *Acronycta leporina* (American).
20. Harpe and clasper of *Acronycta populi.*
21. Harpe and clasper of *Acronycta lepusculina.*
22. Harpe and clasper of *Acronycta felina.*
23. Harpe and clasper of *Acronycta tota.*

All the figures are from sketches made by Dr. J. B. Smith to the same scale with camera lucida.

PLATE XX.

Male genital structures in *Acronycta:*

Fig. 1. Harpe and clasper of *Acronycta cinderella.*
2. Harpe and clasper of *Acronycta pacifica.*
3. Harpe and clasper of *Acronycta transversata.*
4. Harpe and clasper of *Acronycta frigida.*
5. Harpe and clasper of *Acronycta innotata.*
6. Harpe and clasper of *Acronycta betulae.*
7. Harpe and clasper of *Acronycta morula.*
8. Harpe and clasper of *Acronycta occidentalis.*
9. Harpe and clasper of *Acronycta lactifica.*
10. Harpe and clasper of *Acronycta lobeliae.*
11. Harpe and clasper of *Acronycta lobeliae;* small specimen.
12. Harpe and clasper of *Acronycta furcifera.*
13. Harpe and clasper of *Acronycta hasta.*
14. Harpe and clasper of *Acronycta manitoba.*
15. Harpe and clasper of *Acronycta thoracica.*
16. Harpe and clasper of *Acronycta strigulata.*
17. Harpe and clasper of *Acronycta radcliffei.*
18. Harpe and clasper of *Acronycta quadrata.*
19. Harpe and clasper of *Acronycta spinigera.*
20. Harpe and clasper of *Acronycta pruni.*

Fig. 21. Harpe and clasper of *Acronycta brumosa*.

All the figures are from camera lucida sketches drawn to the same scale by Dr. J. B. Smith.

PLATE XXI.

Male genital structures in *Acronycta*:

Fig. 1. Harpe and clasper of *Acronycta superans*.
2. Harpe and clasper of *Acronycta lithospila*.
3. Harpe and clasper of *Acronycta tritona*.
4. Harpe and clasper of *Acronycta connecta*.
5. Harpe and clasper of *Acronycta funeralis*.
6. Harpe and clasper of *Acronycta alni* (European).
7. Harpe and clasper of *Acronycta fragilis*.
8. Harpe and clasper of *Acronycta paupercula*.
9. Harpe and clasper of *Acronycta vinnula*.
10. Harpe and clasper of *Acronycta rerellata*.
11. Harpe and clasper of *Acronycta grisea*.
12. Harpe and clasper of *Acronycta strigosa* (European).
13. Harpe and clasper of *Acronycta mansueta*.
14. Harpe and clasper of *Acronycta falcula*.
15. Harpe and clasper of *Acronycta parallela*.
16. Harpe and clasper of *Acronycta cuspis* (European).
17. Harpe and clasper of *Acronycta tridens* (European).
18. Harpe and clasper of *Acronycta psi* (European).
19. Harpe and clasper of *Acronycta afflicta*.
20. Harpe and clasper of *Acronycta persuasa*.
21. Harpe and clasper of *Acronycta liturata*.
22. Harpe and clasper of *Acronycta marmorata*.
23. Harpe and clasper of *Acronycta megacephala* (European).
24. Harpe and clasper of *Acronycta albarufa*.
25. Harpe and clasper of *Acronycta ovata*.
26. Harpe and clasper of *Acronycta modica*.
27. Harpe and clasper of *Acronycta clarescens*.
28. Harpe and clasper of *Acronycta hamamelis*.
29. Harpe and clasper of *Acronycta retardata*.

All the figures are from camera lucida sketches drawn to the same scale by Dr. J. B. Smith.

PLATE XXII.

Male genital structures in *Acronycta* and allies:

Fig. 1. Harpe and clasper of *Acronycta illita*.
2. Harpe and clasper of *Acronycta luteicoma*.
3. Harpe and clasper of *Acronycta sperata*.
4. Harpe and clasper of *Acronycta euphorbiae* (European).
5. Harpe and clasper of *Acronycta myrica* (European).
6. Harpe and clasper of *Acronycta noctivaga*.
7. Harpe and clasper of *Acronycta menyanthidis* (European).
8. Harpe and clasper of *Acronycta rumicis* (European).
9. Harpe and clasper of *Acronycta emaculata*.
10. Harpe and clasper of *Acronycta impressa*, variety.
11. Harpe and clasper of *Acronycta impressa*, normal.
12. Harpe and clasper of *Acronycta distans*, normal.
13. Harpe and clasper of *Acronycta distans*, variety.
14. Harpe and clasper of *Acronycta auricoma* (European).

Fig. 15. Harpe and clasper of *Acronycta barnesii.*
16. Harpe and clasper of *Acronycta perdita.*
17. Harpe and clasper of *Acronycta edolata.*
18. Harpe and clasper of *Acronycta extricata.*
19. Harpe and clasper of *Acronycta xyliniformis.*
20. Harpe and clasper of *Acronycta oblinita.*
21. Harpe and clasper of *Arsilonche albovenosa.*
22. Harpe and clasper of *Merolonche ursina.*
23. Harpe and clasper of *Merolonche lupini.*

All the figures are from camera lucida sketches drawn to the same scale by Dr. J. B. Smith.